EMERGENCY OPERATIONS CENTER

FEASIBILITY STUDY & REPORT

DECEMBER 1978

prepared for
THE BUREAU OF ARCHITECTURE
DEPARTMENT OF PUBLIC WORKS &
THE MAYOR'S OFFICE OF EMERGENCY SERVICE
CITY & COUNTY OF SAN FRANCISCO

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December 28, 1978

Department of Public Works
Bureau of Architecture
City and County of San Francisco
Room 265, City Hall
San Francisco, CA 94102

Attention: Mr. Norman Karasick
City Architect

Re: Feasibility Study and Report
Emergency Operations Center

Gentlemen:

In accordance with your request for proposal dated October 24, 1978, and the scope of work defined in Section A of the R.F.P., we have prepared the following Feasibility Study and Report.

We wish to express our appreciation for the excellent cooperation and assistance extended by Mr. Arthur Lee and Mr. Verl Hall of your Bureau and to Mr. Thomas Jenkins of the Office of Emergency Service in the development of this report. It has been a pleasure to render these services and we are looking forward to our further association with the Bureau of Architecture on this most important project.

Yours very truly,

REID AND TARICS ASSOCIATES

Charles F. Schrader, AIA
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CONTENTS

SYNOPSIS

Five sites were reviewed on a weighted criteria matrix. Sites under consideration:

- *Christmas Tree Point*
- *Mission Park*
- *Buena Vista Park*
- *Jefferson Square & Hayward Playground*
- *Under Fulton Street (between Larkin and Hyde Streets in the Civic Center Area)*

The City map (Page 5) is provided for reference.

Jefferson Square and Hayward Playfround scored highest as the all around best location for the Emergency Operations Center.

A structure of approximately 31,000 square feet would be built into the sloping hill of Jefferson Square. It would be a totally underground facility except for its entrance and minor air vent structures. The entrance would be off of Turk Street.

Parking for 300 automobiles in an emergency situation would be accommodated on the playfields of Hayward Playground with access from either Turk or Golden Gate Streets. Day-to-Day parking would be at the City owned Parking Lot at Franklin Street and Golden Gate Avenue.

The existing transmission tower of the Fire Department Communications Center (located across Turk Street in Hayward Playground) would be modified for use or replaced with a new communications tower for general broadcast and for micro-wave transmission to Christmas Tree Point.

The site plan (Page 11) shows the Emergency Operations Center location.

The facility is programmed to function as an Emergency Operations Center with daily use as the City's "911" Emergency Telephone System. The Schematic Building Plan (Page 22) shows functional layout.

Occupant use on a daily basis would be 20 to 25 people each shift of three shifts for the "911" program and 5 people for the Office of Emergency Services. It is assumed at this time that the 911 Emergency Telephone System would handle police, fire and ambulance emergencies. Location of the Records Search Section of police service has not been determined at this time.

The facility is designed for a State of Emergency Occupant Load of 340 people.

The criteria for structural design of the EOC is to provide protection against a 5 psi overpressure nuclear environment and seismic conditions. Initial radiation will be attenuated to an acceptable level and a protection factor of 100 will be provided for attenuation of fallout radiation. The underground structure will be constructed of reinforced concrete. A metal shield will be provided on the surface of the structure for electromagnetic protection.

Mechanical and electrical design criteria is for a facility to maintain all critical functions during hazard conditions from fire and flood to earthquake and blast with fallout. The E.O.C. shall be operational for 14 days on a fully self-contained basis.

Cost for the Facility with basic equipment (without communications and computer hardware) is estimated at:

$ 5,750,000.00

Cost for site preparation and related site requirements is estimated at:

$ 1,350,000.00

Total project cost with an ENR basis of 2,866 is estimated at:

$ 7,100,000.00

I SCOPE OF SERVICES

In accordance with the scope of work defined in the October 24, 1978 R.F.P., this Feasibility Study and Report concerns itself with the following major categories:

- *Evaluation of Five Site Areas*
- *Selection of Site which best meets Criteria*
- *Review of Existing Building Program*
- *Development of Detailed Building Program*
- *Investigation of Building Requirements*
- *Environmental Review*
- *Schematic Building Design*
- *Evaluation of Construction Systems*
- *Evaluation of Equipment Systems*
- *Estimate of Site Development Cost*
- *Estimate of Building and Equipment Cost*

Our program review deviated from the required scope of work by analysis of a basic Emergency Operations Center, a 911 Emergency Center, and a combined E.O.C. - 911 program. Such analysis allows conclusions to be drawn on the efficiencies achieved by the combining of functions.

II SITE SELECTION

Selection Criteria:

Four general site areas were suggested by the Bureau of Architecture as meeting criteria for review. These sites met the requirement of being land owned by the City, within the City, and with direct line of sight (microwave transmission) access to the City-owned radio transmission facility at Christmas Tree Point.

Our review enlarged this number to five possible site areas (see Map - diagram #A):

- *Christmas Tree Point*
- *Mission Park*
- *Buena Vista Park*
- *Jefferson Square/M.S. Hayward Playground*
- *Civic Center Area*

In examining each site we established a weighted criteria matrix, which is shown in Appendix A. This criteria consisted of:

Category A - Hazards

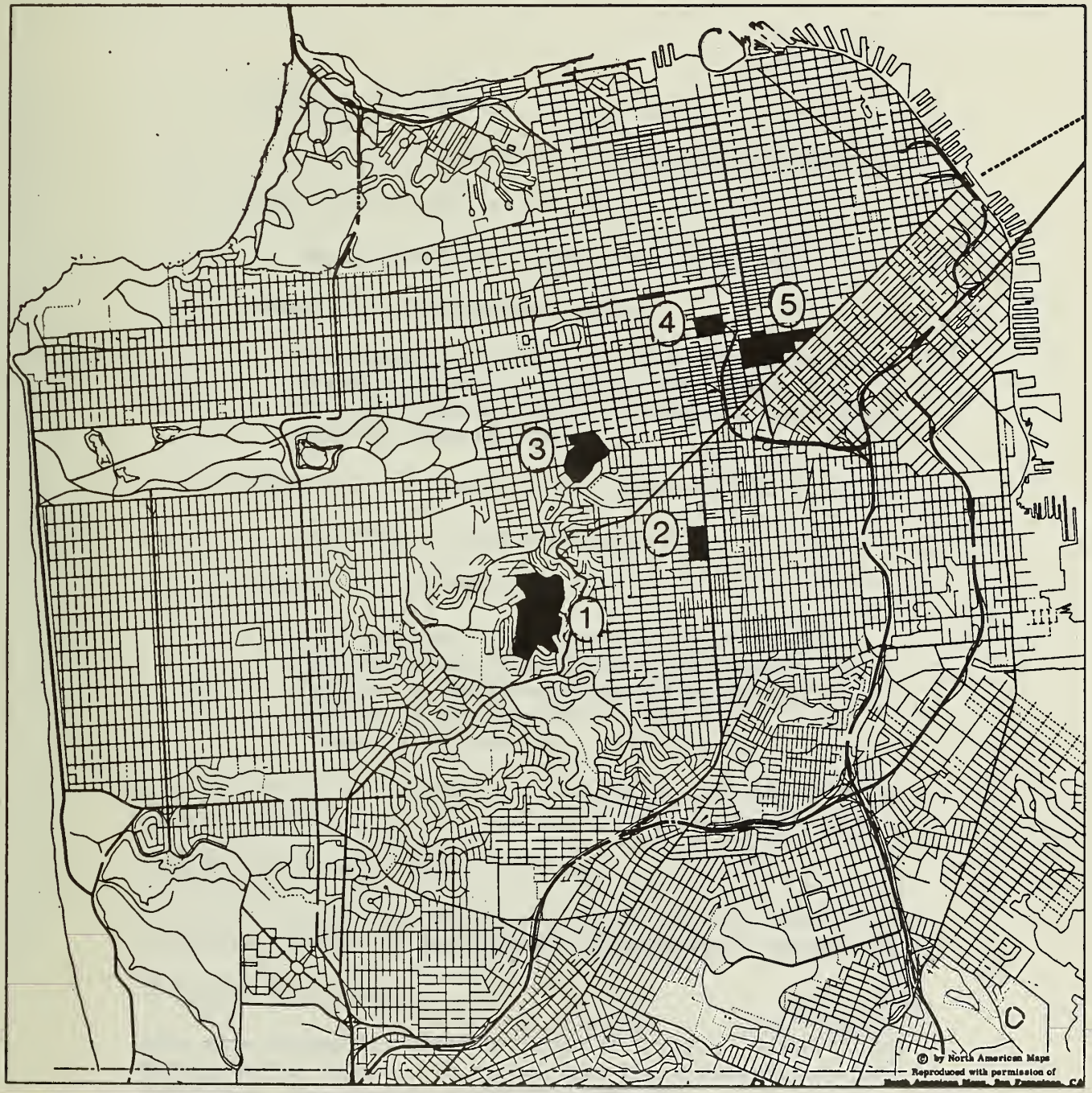
Geologic Stability, Estimated Intensity, Landslide, Liquifaction, Subsidence, Tsunami Inundation, Reservoir, Fire Spread, and Adjacent Building Debris.

Category B - Accessibility

Automobile (Access and Parking), Pedestrian (Walking and Public Transportation), and Air (Helicopter).

Category C - Security

Non-Emergency and Emergency Conditions



SITES
1 Christmas Tree Point
2 Mission Park
3 Buena Vista
4 Jefferson/M.S. Hayward Playground
5 Civic Center

CITY MAP

DIAGRAM A

Category D - Control

Control of Traffic and Control of Pedestrians

Category E - Utilities

Gas, Electricity, Water, Telephone, Sewer

Category F - Environmental Impact

Construction, Traffic, Air Quality, Flora and Fauna, Historical, Political or Community Concern, Acoustic, Noise, Vibration, Aesthetics, Land Use Compatibility.

Category G - Suitability (for Construction)

Topography, Space Availability

Category H - Related Cost

Cost related to the Construction of an EOC Facility which reflects the Correction of Hazards, Accessibility, Security, Control, Utilities, Environmental Concerns and Structure Suitability.

The Chart shown in diagram #3 is the result of this weighted criteria matrix.

Review of Multiple Sites:

Appendix A contains a written evaluation of each site on the eight major review criteria items (Catergories A through H).

Christmas Tree Point:

This site ranked first in the areas of Control, Security and Environmental Impact. It ranked last for Accessibility and Utilities. Its overall ranking was Third.

While its location is quite good for security and though it has a commanding overview of the City, its relative inaccessibility creates problems especially when it is in day-to-day use as an operating 911 Emergency Center.

Mission Park:

A highly desired location in terms of Hazards and Suitability for Structure. This site, however, has problems for Security. Its rating was fair (Fourth), but sites closer to the Civic Center Area and with better transportation and access features proved more suitable for final selection.

Buena Vista Park:

This site placed a distant last in our weighted criteria matrix. It scored at the bottom in Hazards, Security, Environmental Impact, Suitability for Structure, and Cost. It did not score first in any of the eight major categories.

Jefferson Square and Hayward Playground:

This site did not show outstanding strength in any category, but its high placing in all categories gave it an overall rating of Number 1, and number 1 in related cost.

The site is well located in relation to the downtown and Civic Center areas, and is out of the high hazard areas of the City. This site will be described in more detail under "Selected Site".

Civic Center Area:

Areas under consideration included the City Hall, Brooks Hall, the Main Library, Civic Auditorium, 354 Grove Street (City Planning), United Nations Plaza, the Public Health Building, the Old State Compensation Building, and the Fire Department District Headquarters on Golden Gate Avenue. Also considered were the streets in and around the Civic Center Area.

Criteria given by the Department of Architecture stated that existing functions could not be changed. This therefore excluded all existing buildings (including Brooks Hall) except for some form of construction beneath existing buildings, which was considered too costly for serious consideration.

The large, relatively unused parcel of land where the City Planning Building is located was given serious review, but was omitted from final consideration because of its highly desirable location in the Civic Center Area. Coordination of an underground EOC with some other surface structure is a possibility, and may warrant future consideration.

The section of Fulton Street between Larkin and Hyde Streets became the final selected location in the Civic Center Area. This street dead-ends at the Plaza. It is not a major traffic artery, and is presently used for side and center parking, mostly related to activities in Brooks Hall. This street could be closed for a two-year construction period without major disruption of traffic or Civic Center activities.

The facility would be totally underground. Access could be at the bottom of the Brooks Hall ramp and from the existing Underground Parking Structure.

This site scored highest in two of the eight major categories, and was second in overall rating. It has some hazard factors to overcome, and construction cost in that location would be higher than at other sites.

Selected Site:

On the basis of the weighted criteria matrix, the *Jefferson Square and M.S. Hayward Playground* area is the site best suited for the Emergency Operations Center.

The site is convenient to the Civic Center and downtown areas by automobile and public transportation. It is within walking distance of City Hall. The site is sufficiently large to create its own fire barrier, and the scale of adjacent construction is moderate, minimizing the hazard of falling debris.

The EOC structure can be placed into the natural hill of Jefferson Square. Only one-fourth to one-third of the square would be lost during construction, and after construction the site could be restored to its original condition, with the facility totally underground, except for the entrance. No major items of vegetation would be lost in the construction process.

Parking:

Approximately 30 people would be involved in the daily use of the Emergency Operations Center facility. This would include 25 people per shift for the 911 Emergency Service Program, and 5 people for the Office of Emergency Service staff. It is assumed that approximately one half of these staff members will use public transportation which is convenient to the facility. Requirements for 15 automobiles can be reasonably handled at the city parking lot located two blocks away on Golden Gate Avenue between Van Ness Avenue and Franklin Street.

Parking for visitors and supervisory staff can be accommodated by designating curb parking on Turk Street for restricted use and/or by providing parking spaces at the Fire Department facility across the street in Hayward Playground.

During emergency conditions, 300+ automobiles can be accommodated on the playfields at M.S. Hayward Playground. There is existing access to these fields from both Turk Street and Golden Gate Avenue.

Utilities and Transmission Tower:

All utilities are convenient to the site. Buried fuel oil and water tanks will be part of the plan for emergency use situations.

The existing radio tower at the Fire Department Communications Building can be modified and/or replaced with a new tower which would meet both structural and communications requirements. By this method no new vertical element will be needed.

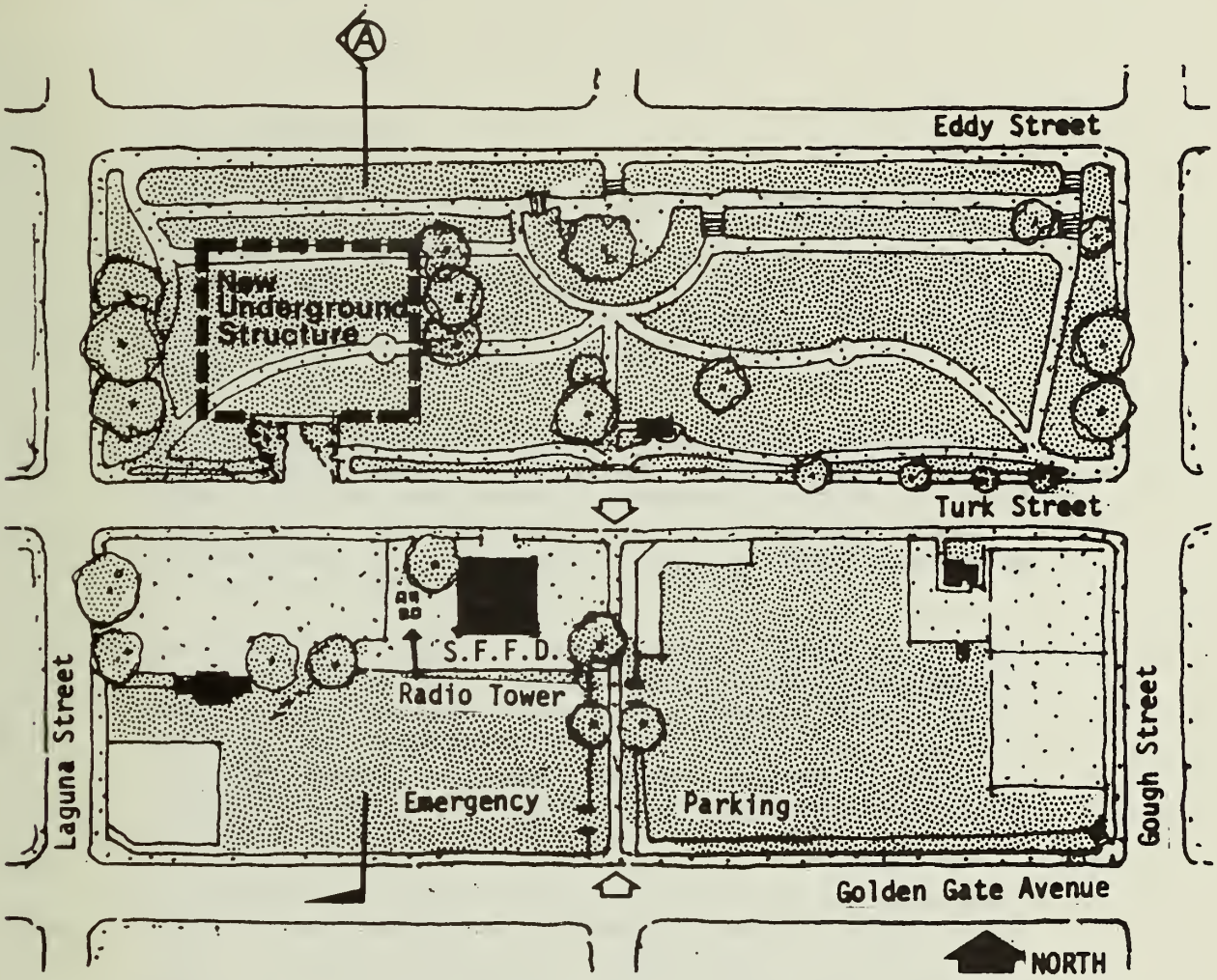
See Diagram C for Site Plan.

SITE SELECTION

SUMMARY

	Team Reviewer	Weighted Value	Christmas Tree Point	Mission Park	Buena Vista Park	Jefferson Square Hayward Playground	Civic Center Area
A. HAZARDS	PB	--	61	68	61	65	61
B. ACCESSIBILITY	RTA	--	7	19	12	28	30
C. SECURITY	RTA	--	25	12	12	15	15
D. CONTROL	RTA	--	20	8	8	8	8
E. UTILITIES	HA	--	36	41	34	44	47
F. ENVIRONMENTAL IMPACT	JA	--	60	45	30	51	58
G. SUITABILITY FOR STRUCTURE	RTA	--	14	18	12	18	12
H. RELATED COST	Team	--	40	49	29	53	46
TOTAL			263	260	198	282	277

DIAGRAM · B



Unpaved - Grass & Vegetation

Asphalt Paving

Existing Buildings

Existing Trees

SITE PLAN

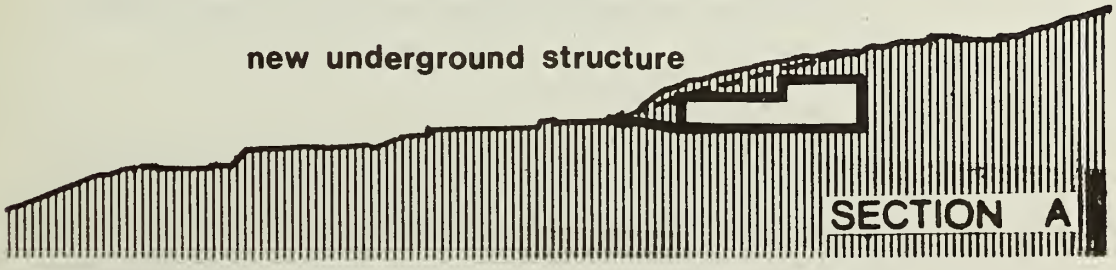


DIAGRAM C

Jefferson Square & Hayward Playground

Soils Information

Jefferson Square covers the two blocks between Turk and Eddy Streets, and between Gough and Laguna Streets. The Jefferson Square Playground occupies the two blocks immediately south, between Golden Gate Avenue and Turk Street. The area is located on the southern slope of the hill that culminates 10 blocks north at Lafayette Square (Pacific Heights).

The highest elevations of Jefferson Square occur at the north-eastern corner, a little below elevation 150 (USGS Datum), and the area drops in elevation to about 110 along Turk Street. The playground area, south of Turk Street, is more level, with the lowest elevation about 90 near the south-eastern corner.

Just north of the site, at Saint Mary's Church, bedrock is at the ground surface. Bedrock here consists of sheared rocks of the Franciscan Formation. However, except possibly for the north-eastern corner, bedrock is in excess of 30 feet below the ground surface. In most of the Jefferson Square area bedrock may be expected at or below elevation 50; in the playground area, below elevation 0.

The overburden consists principally of dune sand deposits near the ground surface, followed by competent sands and clays of varying density and cementation at an unknown depth. In the north-eastern corner, slope debris may be expected near the ground surface. At this time, the location of the groundwater table is unknown, but it is expected to be fairly deep, particularly in the northern portion.

Conditions are good for direct foundation of the structures, and groundwater is not expected to pose significant problems during construction. Excavations may be performed using standard temporary supports such as soldier piles and logging. With good workmanship, ground movements caused by excavations should not disturb adjacent utilities.

The conditions are relatively favorable as regards earthquake safety. With foundations most probably situated in the formation below the dune, and a low water table, there are not risks of soil liquefaction, and amplification of earthquake shaking due to local soil conditions is expected to be moderate. Still, strong shocks can be expected in the even of a 1906-size earthquake. It may be expected that a number of buildings in adjacent blocks will be damaged due to such and earthquake, and some lifelines may suffer disruption. Because of the multiple accessibility, however, it is not likely that building debris or fires will prevent access.

The more level ground of the playground area may offer construction advantages over the steeper Jefferson Square pack area, but other factors, such as present and future use, may have greater impact in the proper site selection.

III FACILITIES PROGRAM

Program Statement: The Emergency Operations Center is to be a protected facility designed to provide the following direction and control functions:

Emergency Functions:

1. Direction, control and coordination of the activities of various components of emergency response organizations, police, fire, public works, welfare and health/medical. Establishment of operational priorities.

2. Issuance of policy statements, regulations, orders and operational schedules.

3. Receipt, evaluation and reporting of Radiological Defense (RADEF) information.

4. Provision of emergency alerting and warning instructions to the public and non-governmental organizations.

5. Provision of a centralized communications system.

6. Direction of the populace to shelter.

7. Coordination of mutual aid and maintenance of liaison with State and Federal agencies and the military establishment.

Day-to-Day Functions:

1. Administration of the local Civil Defense and Emergency Preparedness program.

2. Dispatching of Emergency Medical Service ambulances.

3. Dispatching of messages to police, fire and other emergency services from the proposed single emergency telephone number (911).

General:

The facility shall be designed to protect personnel and equipment against effects of a 5 psi overpressure nuclear environment, and radiation. It shall also protect against the more common conditions of fire, flood and earthquake.

It shall also be designed to be fully operational for a period of 14 days as a self-contained facility. This shall include the ability to provide necessary water, power, food, sanitation, heat, cooling, and treated air.

Population: The Emergency Operations Center shall accommodate the following numbers of people:

Emergency Function:	No. per Shift	Total
Operations Control	57	98
Mayor		
Board of Supervisors		
CAO		
Emergency Services		
Legal		
Operational Information		
Public Information		
Radiological Defense		
Military Liaison		
Facility Maint. & Operations		
Primary Response Services	84	159
Fire & Rescue		
Law Enforcement & Traffic Control		
Health & Medical		
Welfare & Shelter		
Utilities		
Engineering Const. & Housing		
Support Services	46	82
Communications & Warning		
Fiscal Control		
Supply & Procurement		
Transportation & Warehousing		
Manpower		
Religious Affairs		
Total Personnel:	187	339

Daily Operation:

	No. per Shift	Total
911 Program	25	60
Emergency Services	5	5
Total Personnel	30	65

Program for 911 Emergency Service:

A separate area count has been developed on a simple 911 Emergency Service program to better analyze the implication of a facility which houses both an EOC and a 911 program.

Appendix B contains a detailed tabular area breakdown. The following summarizes that table:

Operations Space (Human Use)	6,610 square ft.
Support Space (Human Use)	1,550
Support Space (Mechanical/Electrical)	5,965
Total	14,125 square ft.

Program for an Emergency Operations Center (without 911 Services):

Appendix B contains a detailed tabular area breakdown. The following summarizes that table:

Operations Space (Human Use)	14,085 square ft.
Support Space (Human Use)	7,325
Support Space (Mechanical/Electrical)	5,060
Total	26,470 square ft.

Program for a Combination Facility (EOC and 911 Programs)

The following is a general breakdown of space requirements. Appendix B contains a more detailed allocation of area for operations and support spaces.

1.	Operations Space Requirements		
	Operation Room EOC	1,600	square ft.
	Communications Room EOC	800	
	Operations Control	2,070	
	Primary Response Service	4,110	
	Support Service	2,220	
	Communications Room 911	2,500	
	Reception & Control	250	
	Sub Total	13,550	
	Circulation @ 15%	2,030	
	Total	15,580	square ft.
2.	Support Spaces - Human		
	Sanitary	550	square ft.
	Food Service	2,350	
	Sleeping	1,800	
	Medical	350	
	Maintenance	670	
	Miscellaneous	650	
	Sub Total	6,370	
	Circulation @ 15%	955	
	Total	7,325	square ft.
3.	Support Spaces - Mechanical/Electrical		
	Generators	400	square ft.
	Computers	1,550	
	Public Health @ 200		
	Police Dept @ 600		
	Fire Dept @ 450		
	City Admin @ 300		
	Telephone Equipment	300	
	Data Transmission Equipment	1,200	
	Mechanical Equipment	3,000	
	Transformer	150	
	Battery Room	450	
	Sub Total	7,050	
	Circulation @ 15%	1,060	
	Total	8,110	square ft.

4. Summary

Operations Space	15,580 square ft.
Support Space - Human	7,325
Support Space - Mechanical/Elec.	8,110
Total	31,015 square ft.

Comparison:

A comparison of the three programs demonstrates that certain space efficiencies are attained with the combining of the EOC and 911 Programs.

Combined Facility	31,015 square ft.
EOC (without 911)	26,470
Difference	4,545 square ft.

If a 911 Emergency Facility would require approximately 14,125 square feet, and a similar function added to an EOC Facility requires only 4,545 square feet, it can be concluded that a savings of 9,580 square feet would be realized in the combining of the two functions.

Diagram D shows a schematic floor plan for the combined facility. Diagram E indicates what portion of that facility is used on a daily basis for 911 Emergency Service and the Office of Emergency Service.

IV ARCHITECTURAL FEATURES

General: Minimum architectural finishes will be provided in non-public spaces and those spaces which are used only in an emergency basis. Public spaces used daily will be treated as a conventional office.

A computer floor system will be employed from the computer room (see Schematic Floor Plan, Diagram D) to the communications and operations areas and the adjacent office spaces of support service, operations control and primary response. There will be access to the computer floor from the mechanical room and the telephone equipment room.

Non-Public Spaces: (see Floor Plan, Diagram D)

Mechanical Room
Computer Room
Telephone Equipment Room
Generator Room
Battery Room
Transformer Room
Plant Engineer
Workshop and Repair Rooms
Storage Rooms

Finishes will general be the exposed concrete structure, floors, walls and ceiling, painted where appropriate.

Public Spaces - Emergency Use: (see Floor Plan, Diagram D)

Mens Dormitory
Showers & Toilets
Womens Dormitory
Kitchen & Storage
Medical Exam Room
Decontamination Room
Laundry

Floor Finish: Vinyl asbestos tile except for ceramic tile at showers and toilets. Painted floor at the Laundry Room.

Walls: Furred gypsum board @ exterior structural walls. Metal studs and gypsum board at interior walls. Painted surface. Ceramic tile wainscot at toilet and shower rooms.

Ceiling: Tee bar ceilings with acoustic tile panels. Panels treated for moisture at Kitchen, Laundry and Toilet Room areas.

Public Spaces - Day-to-Day Use
(see Floor Plan, Diagram D)

Operations Control
Support Service
Operation Room
Communications Room
E.O.C. Communications
Primary Response
Lunch Room
Reproduction Room
Control & Reception
Entry & Corridors
Toilet Rooms
Press Room (News Media)
General Storage

It should be noted that the Press Room serves as the Infirmary in an emergency use situation.

The Communications Rooms will be the center of the "911" program. Both incoming request for assistance and dispatch operations will be handled. A large display board will monitor all activities.

A smaller communications room is set-up to handle micro-wave and radio transmission as part of a full emergency operations program.

The large Operations Room will be a flexible space to allow arrangement of chairs and tables as best suits the emergency condition.

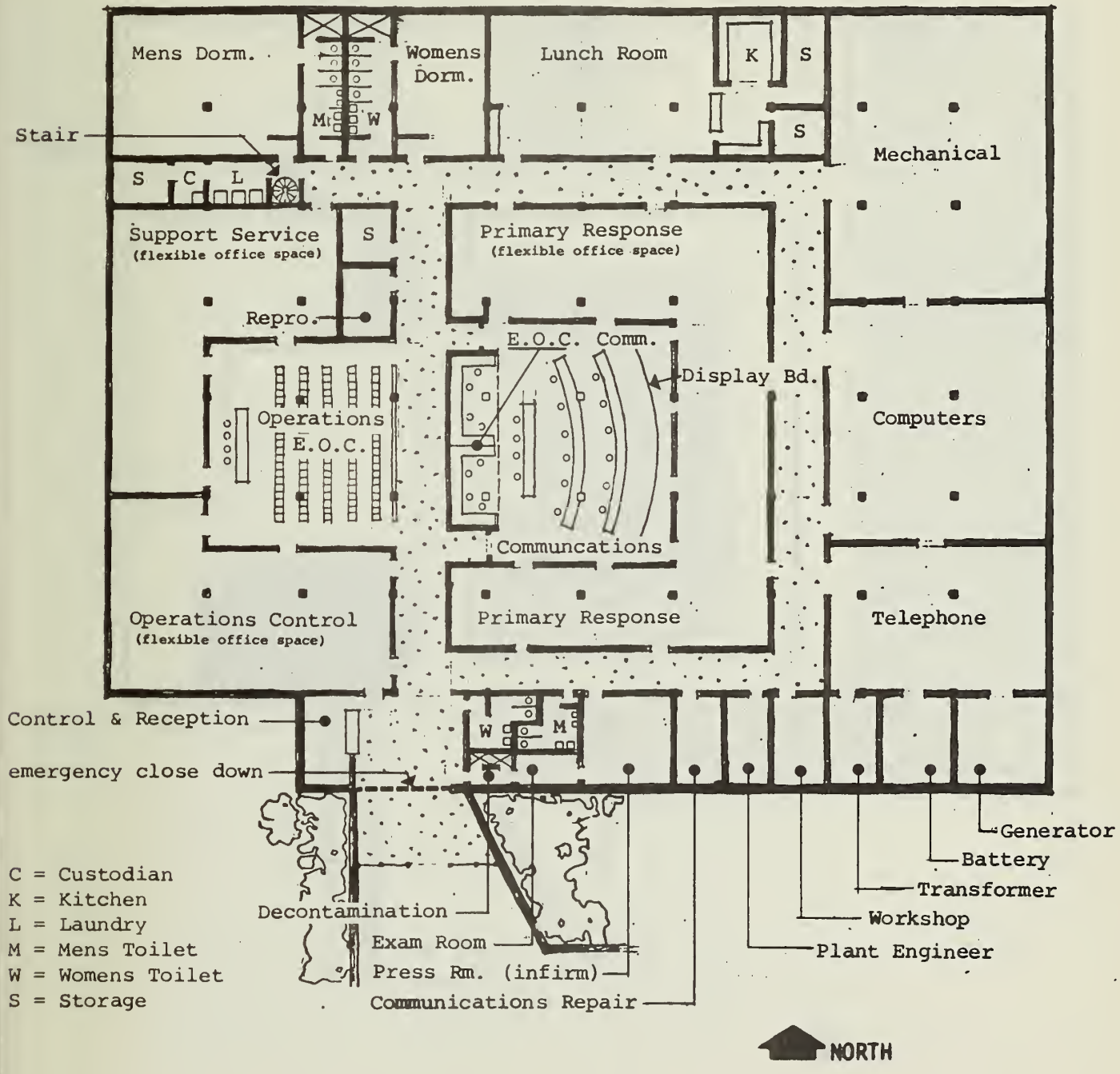
The areas shown on the plan as support service, primary response and operations control will be open plan office landscape space. Departments will be divided and organized with free-standing partitions.

Floor Finish: Carpet over computer floors, (except at Computer Room). This includes Operations Room, Communications Room, Support Service, Operations Service and Primary Response. Carpet also at control and reception and general corridors.

Ceramic tile at Toilet Rooms, Custodial Room, and Entrance Area.

Walls: Furred gypsum board @ exterior structural walls. Metal studs and gypsum board at interior walls with glazed vision panels. Acoustical wall treatment where required for noise control. Surfaces to be painted and/or vinyl wall cover. Ceramic tile at Toilet Rooms.

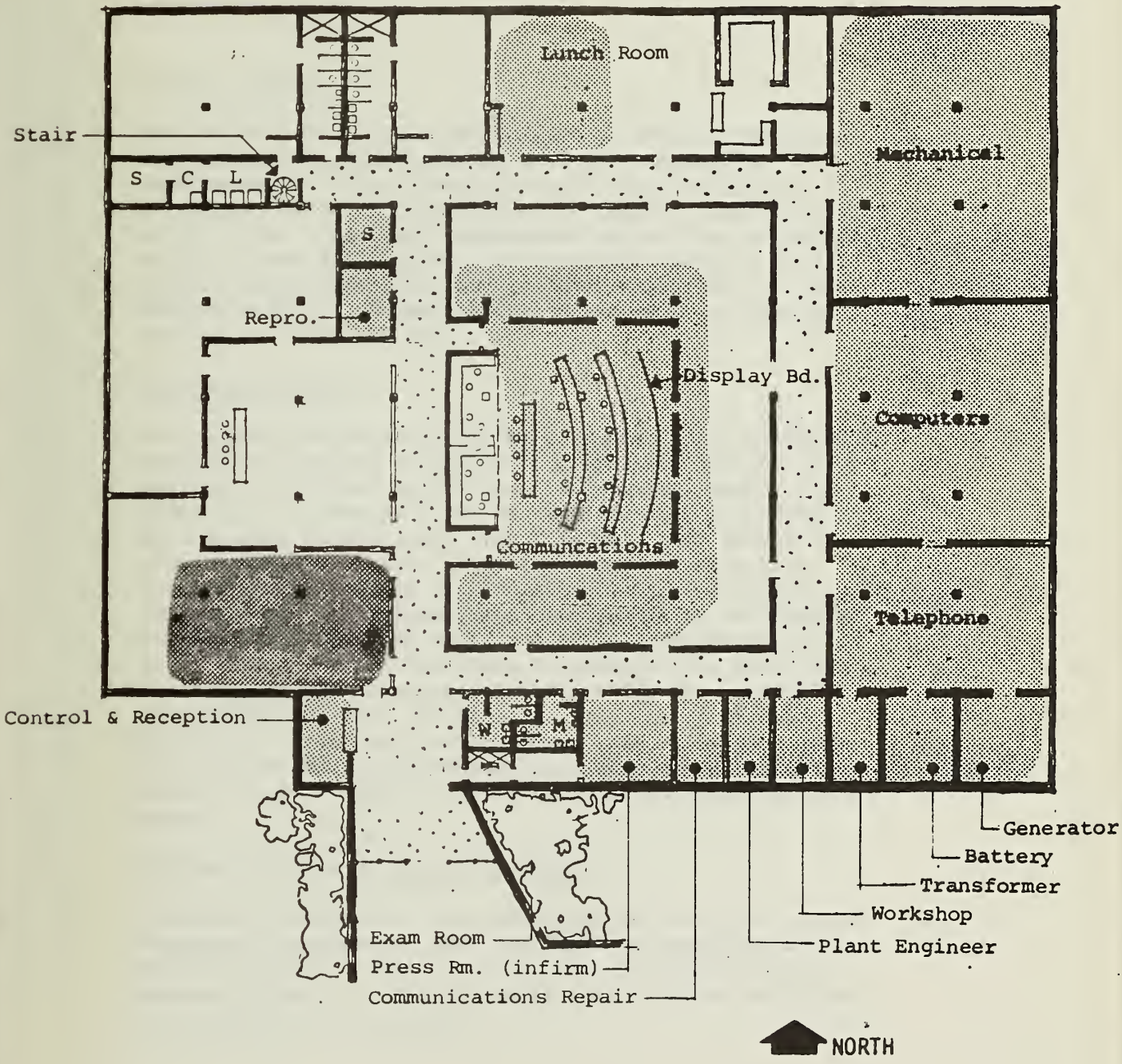
Ceiling: Tee bar ceilings with acoustic tile panels. Moisture resistant ceilings at Toilet Rooms.



FLOOR PLAN - EMERGENCY USE

Approximate area 31,000 sq. ft.

DIAGRAM D



FLOOR PLAN - DAY TO DAY USE

Daily use - 911 14,000 sq. ft.

Daily use - E.O.C. core 1,500 sq. ft.

DIAGRAM E

V STRUCTURAL FEATURES

Threat Criteria

The EOC structure shall be designed to protect personnel and equipment against effects of 5 psi overpressure nuclear environment. Initial radiation will be attenuated to an acceptable level and attenuation of fallout gamma radiation will provide a minimum transmission protection factor (PF) of 100. Ground motion will be evaluated relative to the 5 psi overpressure level and seismic conditions. A fore-warning before a nuclear threat is presumed so that the EOC can be "buttoned up".

Structural Design

The proposed structure consists of a one story underground, reinforced concrete structure. Columns are assumed to be spaced on a 20 foot grid with a 12 inch roof slab. The floor slab is assumed to be as required to accommodate soil bearing pressure and static loads. Drop panels and column capitals at roof level will insure proper load transfer from the roof slab to the columns. Similarly, thickening of the bottom floor slab should be provided at each column. Exterior walls should be 12 inches thick except where special treatment is required for blast doors and valves. The structural solutions for the mechanical and electrical areas are similar. The entire structure should be covered with two to three feet of earth. Back-fill around the structure should be well graded porous material, and a drainage system installed around the peri-meter.

Initial and Fallout Radiation Effects

Protection against initial radiation for the 5 psi contour requires an equivalent mass thickness of approximately 2 feet of concrete. The provision of a 12 inch roof slab and wall with 2 - 3 feet of earth cover will be sufficient to satisfy this requirement.

Fallout gamma radiation attenuation should provide a minimum transmission protection factor of 100. The protection factor (PF) of a shelter indicates the reduction in radiation intensity afforded by the shelter from that which exists outside. For instance, a PF of 100 means that the radiation intensity inside the shelter is 1/100 of the intensity outside the shelter; a PF of 40 means that the intensity is reduced to 1/40 of the outside intensity. According to standards established by the Office of Civil Defense, all shelters should have a minimum protection factor of 40. It should be recognized that, depending on the peak outside radiation intensity, some illness may be experienced. Additional protection should be built in if economically feasible. For emergency operating centers or command posts in which skilled or specialized personnel must continue operations in the interest of community safety or in support of national defense, the protection factor should be at least 100 because the importance of the mission cannot tolerate the disability, however slight, that may occur in the shelter with a lesser PF.

Thus the PF of 100, plus the additional protection inherent in the blast resistant design will be more than sufficient to absorb initial radiation and provide residual fallout protection.

Ground Motion

Ground-induced shock at the 5 psi overpressure level is minor relative to seismic design consideration within the geographic area considered for the proposed EOC. Therefore, seismic design conditions will control free field ground motion for the 5 psi environment. To withstand this level of shock computer equipment should be mounted on shock absorption mountings. Air conditioning ducts, piping and conduits suspended from the roof slab, however, would not require such mountings, but should be securely attached to the slab to prevent relative displacements. Whenever possible, equipemnt should not be mounted on the sidewalls of the building.

There may be sufficient movement of the structure due to seismic effects to rupture any rigid utility connections or ducts that pass through the shelter walls or slabs. This can be corrected at little cost by the use of flexible connections and spring-mounted equipment in the shelter area.

Applicable Codes and Reference Documents

The applicable codes and reference documents in regard to structural features are listed below as follows:

1. Engineering manuals for military construction pertaining to the "Design of Structures to Resist the Effects of Atomic Weapons".

2. ASCE Design Manual No. 42.

3. Air Force Design Manual AFSWC-TDR-62-138.

4. ACI Building Code Requirements 318-71.

5. AISC Specification for Steel Buildings.

6. Protective Construction Review Guide of Department of Defense.

7. Other applicable local codes.

VI. MECHANICAL FEATURES

General

The principal features of the mechanical systems for the Operating Center are as follows:

1. (a) Filtered air supply to pressurize the occupied spaces sufficiently to prevent infiltration of contaminated outside air and to maintain the chemical composition of the air within the limits of human tolerance, and

   (b) additional air supply for the heat-rejection apparatus in the underground space and for the combustion requirements of the diesel engine.

2. Water supply for domestic consumption and for cooling use.

3. Prime movers for the emergency electric generators.

4. Air-conditioning system for temperature and humidity control.

5. Industrial cooling system for the centrifugal chillers and prime moves.

6. Plumbing for toilet, kitchen, laundry, medical, and decontamination facilities, consisting of domestic hot and cold water and sanitary waste and vent systems.

7. Sprinkler and standpipe systems for fire protection.

8. Incinerators for the disposal of waste materials.

The mechanical systems will be designed to function without reliance on outside services during a 14 day emergency period. Pumps, fans, refrigeration machines, heat-rejection apparatus, and air blast valves will be redundant, to allow for preventive maintenance and for major repairs without compromising the continued functioning of the various building services. Air intake and vents, storage tanks, and piping entering the building will all be hardened and otherwise protected to the same degree as the principal structure.

Air Conditioning

An air conditioning system is required to maintain design conditions of 75° F temperature and 50 percent relative humidity 24 hours a day, year-round, during both normal and emergency operation. The system automatically adjusts to load fluctuations brought about by the varying combination of outdoor air temperatures, numbers of personnel, and heat dissipation by lights and data-processing equipment. To provide the necessary flexibility for heating, humidification, cooling and dehumidification, and to minimize the space requirements for distribution ductwork, the air conditioning system will probably be of the high velocity, dual-duct type; however, other variable air volume systems will be considered in the design phase.

Outdoor Air Apparatus: Outdoor air, admitted through an intake shaft and blast valves, is prefiltered through automatic roll-type filters, then handled by duplex outdoor air fans, and then discharged through duplex banks of submicron particulate filters. Those filters are placed downstream of the fans to prevent leakage of unfiltered air into the system. Collective protection against chemical, biological, and radiological contamination is not required. Each of the fans and filter banks is designed to permit the use of either fan in combination with either filter bank. Preheat and precooling coils are provided to temper the outdoor air as required. After tempering, the air is discharged to the main air conditioning units.

Main Air Conditioning Units: One central station air conditioning unit will serve the Operating Center where the computer facility is located. A second unit will serve the balance of the Center. Each air conditioning unit includes duplex fans which draw return air through ductwork from the conditioned space to the intake plenum of the unit. The mixture of outdoor and return air is filtered to remove room traffic dirt. In the computer area air conditioning unit, these filters are of the 85 percent efficient, replaceable type. In the general use unit, they are the automatic roll type. Duplex supply air fans discharge the mixed outdoor and return air over cooling and heating coils.

The varying proportions of the supply air passing over the cooling and heating coils are determined by the total demands of the conditioned spaces for cold or warm air. The output of the cooling and heating coils is controlled by a dewpoint controller located in the cold air duct and a temperature controller located in the warm air duct, respectively. The conditioned air leaving the coils is carried at high velocity through separate warm air and cold air distribution ducts.

Each return air fan and supply air fan is capable of handling the entire air volume delivered by the air conditioning unit.

Distribution Ductwork: Cold and warm air is distributed at high velocity to the various dual-duct mixing units. Each mixing unit serves a zone consisting of several conditioned spaces. The warm and cold air delivery to the units is proportioned by thermostatically-controlled, motor-actuated dampers within the unit. The units also incorporate a volume control mechanism, which maintains the discharge volume of the unit nearly constant. It also reduces the velocity pressure of the air supplied to the unit. The mixture of warm and cold air is discharged from the units at conventional (low) velocity and pressure and is ducted to the conditioned spaces.

Refrigeration: The refrigeration design load is 150 tons. Two refrigeration machines will be provided, each having a capacity of 112.5 tons (approximately 75 percent of the total load). If one machine is out of service at a time of peak load, room temperature and humidity will rise above design values but will remain within safe operating limits of the data-processing and communications equipment. To achieve this, it will be necessary to limit the lighting load to the minimum consistent with the operating requirements of the facility. The refrigeration machines will be packaged chillers with open-type centrifugal compressors having inlet-vane capacity control. In order to improve the power factor, the compressors will be driven by synchronous motors. The units will be furnished with reduced voltage starters.

Duplex pumps will circulate chilled water through a closed circuit between the chillers and the cooling and pre-cooling coils. Each pump will be capable of circulating the entire chilled water flow.

Heating: Water coils are provided for preheating and reheating the air supply. The heating medium is water which has absorbed the heat rejected from the chiller condensers and the prime mover heat exchangers. Electric heating coils are provided to accommodate peak demands.

Generator Room Air Conditioning. An air conditioning unit will limit the space temperature to 100° F under full load emergency power conditions. The unit will be arranged for 100 percent recirculation, and will include throwaway type filters and a chilled water coil.

Controls: The automatic control system will be of the electric, electronic or pneumatic type. A central control console will be provided for indication and control of the essential features of the air conditioning system.

Building Pressurization

To prevent the infiltration of contaminated outdoor air, the building will be maintained at a positive static pressure of 0.25 inch water gage. Duplex fans draw exhaust air from the toilet rooms, kitchen, medical area, and decontamination area, and from the building corridors. Each exhaust fan is capable of handling a volume of air equal to the outside air intake rate. A static pressure regulator controls the modulation of a motor actuated damper, which varies the excess of outside air over exhaust air to maintain the design static pressure within the building. The exhaust air is ultimately discharged through blast valves into the exhaust shaft.

Water Supply

A reliable water supply will be developed with a storage tank system. The water requirements are calculated on the basis of 25 gallons per capita per day during normal operations and 15 gallons per capita per day during the 14 day button-up period.

Prime Movers

It is to be noted that either diesel engine generators or gas turbine generators may be applicable to this installation.

The use of gas turbines would require the installation of blast-resistant intake and exhaust shutoff valves and appurtenances. That would not be necessary for the diesel engines, since their intake filters and exhaust mufflers are designed to withstand 15 psi overpressure. The use of turbines, however, reduces the required heat-rejection capacity, and the size of the cooling water pumps and piping. Gas turbines would probably not be reliable for this installation due to their dependence on utility supplied gas service. The final selection between gas turbines and diesel engines will be made during the design phase of the project, on the basis of space requirements and installed costs. Space proofing and cost estimates for this report are based on the use of diesel engine generators.

The diesel engines for the emergency electric generators will be designed for continuous standby duty at their rated capacity. The engines will be fueled with No. 2-D diesel fuel oil, and will operate at a maximum speed of 1,200 rpm. The engines and their accessory components and controls will be furnished, together with the generators described in the electrical section of this report, as complete, skid-mounted engine generator units. The units will be assembled and tested at the factory. A 14 day supply of fuel oil and lube oil will be stored in underground tanks. Fuel oil and lube oil pumps, both duplexed, will draw from the tanks and discharge, respectively, to day tanks and reservoirs furnished as part of the engine generator units. Combustion air for the diesel engines enters through a separate intake pipe and passes through filter silencers before being admitted to the engines. The combustion gases pass through mufflers and are discharged to the outdoors through an exhaust pipe. The engines are provided with individual filter silencers and mufflers. Each engine generator unit will be provided with an auxiliary electric motor-driven pump, to circulate jacket water when the unit is not operating. An electric immersion heater will maintain the jacket water at 90° F.

Industrial Cooling System

Industrial cooling is required to dissipate the heat rejected from the chiller condensers and from the jacket water and lube oil heat exchangers of the diesel engine generator units. Two heat rejection units will be provided, each having

a capacity of 75 percent of the total load. When one of the units is out of service, satisfactory operation of the system can be maintained by reducing the air conditioning load, which in turn reduces the demand for electric power.

Plumbing System

The plumbing system will consist of plumbing fixtures, a sanitary waste and vent system, and a system for the distribution of domestic cold and hot water. Domestic cold and hot water are distributed to the plumbing fixtures; hot water recirculation is provided. Water supply for the sprinkler and standpipe systems is taken from the domestic cold water distribution main. The sanitary system drains by gravity into a sewage ejector pit. Duplex sewage ejectors discharge to a sewage disposal facility outside the Operating Center. Local sanitary vents terminate at the ceilings of the rooms in which they are located, and are fitted with odor-neutralizing activated carbon canisters. A separate sewage ejector will be provided to serve the decontamination area toilet and showers.

A septic or chemical type sewage disposal system will be included in the design for use should loss of the street sewer system occur.

Fire Protection

The following fire protection systems and equipment will be provided:

1. Standpipe system with occupational hose stations.

2. Wet sprinkler system in the tape storage area.

3. Class "A" fire extinguishers at appropriate locations, and dry chemical fire extinguishers in the communications and computer areas, the power plant, and the mechanical and electrical equipment areas.

4. Fire alarm system.

Incinerators

Trash will be picked up by regular service on a normal operations basis. A small incinerator will be provided for the 14 day button-up period. This incinerator will be feed by the same fuel as the diesel engines. It is designed to handle waste consisting of 50 percent wet garbage and 50 percent trash.

Protection Devices

The protective devices for the Operating Center are as follows:

1. Every pipeline entering the Center will be suitably valved to prevent the effects of blast overpressure from being transmitted into the facility. The valves will be located immediately inside the building at each point of entrance. In addition, each entering pipeline will be grounded by welding to the reinforcing rods for protection against EMP effects.

2. Air intake and exhaust openings are equipped with poppet-type blast valves which prevent blast overpressure from entering the facility. These valves are blast-actuated and have means of positive locking. They will also be fitted with a release mechanism to allow for remote manual closing. The valves must be reopened manually.

3. The facility environment is monitored for oxygen and carbon dioxide content and for radiation level.

No special sensing devices are provided to minimize the possibility of a covert attack; however, the air shafts leading to the surface level (atmosphere) will be designed to preclude items such as bombs from being dropped into them.

VII. ELECTRICAL FEATURES

Electric Power Sources

Two main sources of power will be available to maintain electric power for this facility. Either source will have the capacity to supply 100% of the electrical load.

The normal source of power will be supplied by Pacific Gas and Electric Company's distribution system.

In event of failure of this utility company source of power, diesel generators within the building will automatically be energized and come on line within 10 seconds of utility power failure and supply all electrical loads. Upon resumption of normal utility company power, and after a short period of delay to allow for utility company voltage fluctuations, the service will automatically switch to the utility company source and the generators will stop. To avoid loss of essential computer data in the interval after utility company power fails and before the generators come on line, an uninterruptible power supply in the form of batteries will provide interim power to the computers.

Normal Power: Underground service will be constructed between the utility company's nearest pole and the utility company's primary to secondary transformers located in an underground vault. Secondary voltage will be 208/120 volts, 3 phase, 4 wire, terminating in a main switchboard rated at 1200 amperes. The switchboard and its protective devices will be rated to exceed the available fault current and will also be designed to protect equipment downstream from the switchboard.

Emergency Power: Two 175 KW diesel powered generators will supply power to the main switchboard through automatic transfer switches which sense failure of normal power and automatically signal the generators to start and switch the incoming service from normal to emergency mode. A buried fuel tank will contain enough diesel oil to operate the two generators at rated capacity for 14 days.

The batteries comprising the uninterruptible power supply (UPS) for the computer systems will be connected to the emergency system to supply the computers which are an integral part of the emergency services system operation.

Distribution

The distribution system will be segregated into three basic parts: (a) lighting, receptacles and small power loads, (b) motors and pumps which are part of the building mechanical system, and (c) computer equipment. This will isolate voltage surges caused by motor starting and also permit the computer equipment to be supplied by the UPS. System feeders will consist of type THW stranded copper conductors in metallic conduit serving panelboards and motor control centers.

Distribution, lighting and power panelboards will consist of molded case, bolted circuit breakers with three phase busing arranged in sheet metal enclosures. Motors will be supplied from motor control centers having grouped magnetic starters in draw-out compartments.

Wiring for computers will consist of copper conductors run in conduit below accessible raised floors providing access to equipment connections.

Lighting Systems

Lighting fixtures, in general, will consist of fluorescent fixtures utilizing energy efficient ballasts, radio suppressors, and high quality, acrylic shiedling lenses. Lighting fixtures will be arranged to emphasize task lighting where appropriate instead of overall uniform illumination. Lighting loads will comply with maximum wattage allowances permitted by Title 24, Energy Conservation Standards for New Non-residential Buildings. Rooms larger than 100 square feet will have multiple switching arranged so that lighting levels may be reduced when desired.

Special care will be given to lighting of control room consoles.

Communications

Telephone: Service conduit will be extended underground from Pacific Telephone and Telegraph's nearest utility pole to an equipment room with a main terminal in this building. A conduit faceway system will extend from this terminal to a sub-terminal and then to individual phone outlets. Cable will be furnished and installed by the utility company.

Facilities will be provided in this building for operation of the 911 emergency phone system.

Radio: Since this building will serve as the headquarters center for emergency radio systems, a termination point for conduits and cable connecting to the antenna tower will be provided to provide for emergency radio communication for the city Police, Fire, Public Health and Administrative departments.

Miscellaneous Systems

Grounding: A complete equipment grounding system for all wiring and devices will be provided.

Fire Alarm: A supervised, closed circuit, non-coded system consisting of manual stations, audible and visual alarms and products of combustion detectors in selected rooms and in air supply and return ducts to control supply and return air fan equipment will be provided. The system will also include a control panel with audible and visual trouble signals and an annunciator panel with building zones identified.

City Connections: Connections will be provided to the land lines for the police and fire alarm street boxes.

Clock System: A regulated clock system to provide accurate and uniform time for all building clocks will be provided.

VIII ENVIRONMENTAL REVIEW

Environmental Setting

Project Site

The project site is located approximately one (1) block northwest of San Francisco's Civic Center Area (see Diagram A). It is bounded on the north by Eddy Street, on the south by Golden Gate Avenue, on the east by Gough Street and on the west by Laguna Street. The site is divided by Turk Street. According to the City's general zoning plans the entire area is zoned for public use (P), with Open Space (OS) height and bulk limitations.

Approximately 90% of the site (both parcels) is used for park and recreation, with the remaining 10% used as the emergency operations center of the City and County of San Francisco Fire Department.

The M.S. Hayward Playground is flat with grass covered playfields, cement concrete paved pedestrian walkway and a sports pavilion. It is bounded by a fence with three (3) entrances (one each on Golden Gate, Laguna, and Turk Streets). The Jefferson Park and Recreation area unlike M.S. Hayward and the Fire Department Emergency Operations Center has no fence. The land slopes in a southerly direction, at a grade of 8 percent. The park contains a few indigenious trees and vegetation (grass) which covers approximately 75% of the area; of the remaining 25%, about 1-2% is used for public structure housing restrooms and the rest for public access/egress which is covered with asphalt and cement concrete. In a few places, especially along the pedestrian walkways, there are mature trees and shrubs.

There are no historic structures on the site according to the City's and National listings of historic structures and places.

Surrounding Properties

The land use of the area immediately to the south and west of the site is mainly residential. The area to the north has residential, commercial and institutional (school) land uses; and, the area to the east has institutional (church

and school) and office land uses. The residential area south of Turk Street is known as the Western Addition Area Two, Redevelopment Area. The area residents are mainly of mixed ethnicity and low income. The vegetation of the area consists of some scattered non-indegenious trees and shrubs.

Environmental Impacts of the Proposed Action

The proposed project principally involves the construction of an underground structure (Emergency Operations Facility) with an at grade access and egress, provision of 30 spaces of long-term parking and erection of a 60 ft. antenna. The structure would occupy approximately 31,500 square feet of space. During the day-to-day operation of the facility approximately 30 people occupy the facility. Half would come by automobile.

As a routine check of the emergency power supply system two (2) 175 KW generators would have to be operated for 1 hour once every week. These generators would produce noise and some air emissions.

Based on the above action there would be the following environmental impact categorized according to the degree of magnitude:

. No Effect

Air: There would be some pollutants from the generators, but the effect would be insignificant.

Plant Life: Depending on the exact location, some mature trees could be lost. None of the trees, however, are listed on the endangered species "Blue Book".

Animal Life: Depending on the exact location, some animal habitats could be disrupted, however, none are considered endangered species.

Archeological/Historical: No archeological findings or historic structures are known to exist at the site; however, a professional archeologist should be consulted before the final location is selected.

Adverse Slight

Earth: Approximately 640,000 cubic feet of soil would have to be excavated before the facility can be constructed. Also, approximately 192,000 cubic feet of soil would have to be recompacted on top of the facility.

Noise: People living and working in the area would be exposed to the noise from the generators for a period of one hour, once every week. The noise level, while short-lived, could be very annoying to the human ear.

Land Use: Some of the public open space would have to be used for the micro-wave antenna if the antenna cannot be located near the existing fire department antennas. This has implications relative to the city's regulation on the use of public open spaces.

Transportation/Circulation: Presently, the only parking at the project site is limited to on-street parking. These are fully occupied during working hours. If no additional open space is to be acquired, then approximately 30 on-street parking spaces would have to be displaced for long-term EOC employee parking. The traffic generated by the proposed project would be small (approximately 30 vehicles) and consequently, the impact to the surrounding area would probably be negligible.

Public Services: The nature and operation of EOC's require some degree of security and protection but this would be an intrinsic part of the design features included in the facility.

Energy: Substantial amounts of fuel or energy would be required for heating and cooling the EOC facility and for operating the EOC facility.

Aesthetics: The erection of the micro-wave antenna would present some degree of obstruction and disruption of the scenic vista or view open to the public.

Recreation: Depending on the exact location, either M.S. Hayward or Jefferson Park would have to be closed for approximately 2 years during the construction of the EOC.

Political and Community Concerns: As mentioned above, the proposed facility would require 1/3 of the park to be closed for a period of 2 years and this would deprive the community of a recreation facility for thatperiod. The city would require information demonstrating the necessity of the facility before clearance would be given for construction.

Adverse Environmental Effects which Cannot be Avoided if the Proposal is Implemented

The proposed site will entail unavoidable impacts, including consumption of non-renewable energy and material resources, increased fuel consumption for equipment operation, heating and cooling, increased ambient noise level from generators, soil excavation and compaction and temporary construction impacts affecting ambient noise levels, air emission levels and neighborhood parking supply/demand.

Mitigation Measures Proposed to Minimize the Impacts

- The structure should be constructed as far away as possible from the residential uses and the mature plants.
- Generators producing the least amount of noise should be used; and in addition, special attention should be given to other noise reduction techniques applicable to generators. The emissions associated with the generator should not exceed EPA air pollution standards.
- The design of the facility should take into consideration the continued use of the land above the facility (ground level) for open spaces.
- Off-street parking should be provided to the east of the site, away from the surrounding residential areas.

- Construction of the facility should commence during the later part of fall when less people use the park. In addition, during site excavation dust and dirt would be less of a problem due to natural dampness.

- Landscaping techniques should be employed which help minimize the visual intrusion of the facility, particularly the antenna, into the surrounding area.

Alternatives to the Proposed Project

A part of the consultants' task was to consider Christmas Tree Point as an alternative location if clearance cannot be obtained to construct on any of the other four sites. Of the five (5) sites considered the environmental evaluation indicates Christmas Tree Point to be the most favorable site. However, at Christmas Tree Point, other factors including the cost related to construction, and mitigations of problems associated with erecting construction equipment and accessibility would require special consideration, which tend to offset the environmental favorability of the site.

The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

No long-term cumulative effects which may seriously affect the site-specific or area-wide environment are anticipated from the implementation of the proposed action. The proposed facility focuses on improving the efficiency and coordination of emergency operations, the reliability of communication during an emergency and improved working environment of personnel connected with EOC operations.

Any Irreversible Environmental Changes Which Would be Involved in the Proposed Action Should it be Implemented

Irreversible environmental changes resulting from the proposed action include commitment of land, energy and construction materials. The extent of such commitments is described in Chapters IV and V.

The Growth-Inducing Impact of the Proposed Action

The proposed action is intended to improve emergency communication response to maintain or save lives and otherwise respond to disasters. Thus, the facility fosters the sustaining of life and perhaps this could be considered as indrectly being growth inducing. However, as commonly thought of, the proposed project is not growth inducing.

IX EMP PROTECTION

General: The electromagnetic pulse(EMP) which is generated by nuclear detonations can have a destructive effect on electrical and electronic equipment. Thus, incorporation of EMP protection into the EOC is essential to facilitate communications with others after a nuclear event.

In explaining the effects of EMP, an analogy is often drawn between EMP and natural lighting. Despite vast differences between the characteristics of the phenomena, this analogy is useful for purposes of illustration, for both can cause the same types of damage. Like lightning, EMP can cause "functional damage" (i.e., burnout or permanent gross changes of characteristics of components) or "operational upset" (e.g., opened circuit breakers). Most of the EMP damage occurs because the energy, which appears in the form of strong electromagnetic fields, is converted into very large currents and voltages when it impinges on cables or other conductors. These currents and voltages, in turn, can damage sensitive components, particularly semi-conductor devices.

EMP protection for the EOC should include the following measures:

Shielding: A continuous sheet metal housing enveloping the entire inside, or the entire outside surface of the facility is the most effective means available for providing EMP protection. The metal housing attenuates EMP by reflection and absorption of the incident fields. To prevent degradation of this protective envelope, all mechanical and electrical penetrations through the shield must be treated properly.

A cost effective way of providing the shielding on the inside of the structure is to use metal"Q-Decking"as a part of the form work for the reinforced concrete and leaving the decking in place.

Openings: Openings for doors, escape hatches, and ducts require special shielding and protective techniques. Air vents should be specified in terms of the attenuation required over a specified range of frequencies. Allowable air drop in the vent should also be specified in terms of pressure drop versus velocity.

Penetrations of Metallic Shield: Penetrations through the metallic shielding of the facility should be made at a single location. All incoming service should be in plastic or ferrous metal pipe. All metal shield cables, conduits, and pipes should be welded to the building shield.

Grounding: A low resistance impulse and surge ground system is necessary for protection against EMP. The ground connection should be made to the metal shield. Lighting arrestors should be provided for antenna mast and cables.

Signal and Telephone Lines: Overvoltage protection measures should be applied at the point where the lines first penetrate the shelter wall. All incoming lines (this includes power, telephone, and data lines) should be such that at the entry point, gas gap protectors can be mounted on a bulkhead which, in turn, can be electrically connected directly to an impulse grounding system.

Internal Power and Control Wiring: The type of conduit used in distribution of power conductors and control conductors within the facility is important. Rigid ferrous conduit with threaded couplings can provide a sufficient shielding of conductors contained therein.

Emergency Power: A forewarning before a nuclear threat is presumed so that emergency power may be started and commercial power can be disconnected. Protective measures should be provided for vulnerable points of the emergency power system. These points include remote control conductors, remote indicator wiring, generator exciter control, and battery charging circuits. All such conductors should be contained in ferrous conduit with threaded couplings. Power distribution from the generator must be similarly contained in ferrous conduits. Switches, junction boxes, panel doors and covers should be suited for application of radio frequency gaskets or electrically conductive bonds at mating seams.

Commercial Utility Lines: It is usually anticipated that commercial utility lines will be destroyed or deactivated for extended periods of time so a transfer switch will normally be available to switch the load to the emergency power system. This transfer switch must be protected from

damage from the initial EMP encountered. A standard lighting arrester with addition of pulse sloping capacitance at the transfer switch is normally sufficient for this purpose if connection to a low impulse impedance ground is available at the transfer switch and the switch is on the high voltage side of a stepdown transformer. Typically, the nearest existing lighting arrester will be on the last overhead transmission line pole and will not provide sufficient protection. The site survey should locate and evaluate the quality of existing arresters, potential transfer switch grounds and distribution transformers. Either the use of an electrostatically shielded stepdown transformer with the shield grounded through the low impulse ground, or the addition of a grounding transfer switch link will provide additional protection.

X COST ESTIMATE

The cost estimate for the EOC is presented in Table 1. The total estimated construction cost include the cost estimated for the work items listed. These work items include mobilization and demobilization, earth work, reinforced concrete, electromagnetic protection and waterproofing, architectural work, utilities/electrical and mechanical equipment, telecommunications and micro-wave conduit and restoration and landscaping.

Appropriate landscaping will be provided as required to restore the park to its natural condition. The estimated utilities costs are for utilities outside of the building. Telecommunications and micro-wave cost include the cost of conventional equipment such as conduit runs from the antenna tower to the computer room. The telecommunication and micro-wave cost do not include specialized computer and telecommunication hardware and software.

Other items not included in this cost estimate include site acquisition cost, other institutional cost which might be involved in implementing the project and architectural/ engineering and construction management costs. The architectural/engineering and construction management cost should be in the order of 15-20% of the construction cost.

The estimated costs are based on December, 1978 prices for the San Francisco area. A 25% contingency is included to cover unforeseen design and construction requirements. Allowance for escalation has not been included in the estimate. This escalation factor may be at a rate of about 8-10% per year.

Implementation Schedule

The design time for the EOC is estimated at approximately 12 months. The probable construction time is estimated at 2 years. Lead time in the acquisition of specialized hardware and software computer and telecommunication equipment could be a critical item in the facility meeting a scheduled operation date.

Table 1

COST ESTIMATE

	Work Item	EOC w/o 911 Cost **	EOC w/911 Cost **
1.	Mobilization/Demobilization	200,000	200,000
2.	Earth work (excavation w/tie-back wall system and backfill)	902,000	1,007,000
3.	Reinforced Concrete	1,202,000	1,380,000
4.	Electromagnetic Protection and Waterproofing	193,000	215,000
5.	Architectural (partitions, finishes, doors, etc.)	1,260,000	1,440,000
6.	Utilities/Electrical/Mechanical	950,000	1,064,000
7.	Telecommunications/Micro-wave *	300,000	300,000
8.	Restoration/Landscaping	100,000	100,000
	Sub Total	$5,107,000	$5,706,000
	Contingency (25%+)	1,278,000	1,427,000
		6,385,000	7,133,000
	Dec. 1978 Cost, say	$6,400,000	say $7,100,000

* Operating equipment not included

** Includes contractor's overhead and profit

A P P E N D I X

December 19, 1978

MEMORANDUM

TO: Parsons Brinckerhoff
Hayakawa Associates
Jefferson Associates

FROM: Charles Schrader, AIA
Reid and Tarics Associates

RE: Use of Site Selection Forms

A. Scoring: Score each item for each site on a value of 1 to 5. 5 represents the most acceptable and 1 the least acceptable. Ideally the sites would be listed 1 through 5 from least desirable to most desirable. Where this is not practical, and sites are equal, equal values may be given (i.e., 1 @ 5, 1 @ 4 and 3 @ 2).

B. Cost Scoring: Cost score each item in order of 1 to 5, with 5 representing the least cost additives to meet requirements and 1 representing the most cost additives to meet requirements. Again, ideally the sites would be listed in a 5 through 1 sequence. Where equals exist, give equal values.

C. Weighted Value: Let's work in a value system 1 to 3 with 2 as the average. Those categories which you feel are more important than the average should be given a weighted value of 3, those which are less important than the average should have a weighted value of 1.

D. Summary: Over and above the selection forms, please write a general narrative on each site related to your review criteria.

SITE SELECTION

SUMMARY	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S., HAYWARD PLAYGROUND	CIVIC CENTER AREA
A. HAZARDS	PB	--	61	68	61	65	61
B. ACCESSIBILITY	RTA	--	7	19	12	28	30
C. SECURITY	RTA	--	25	12	12	15	15
D. CONTROL	RTA	--	20	8	8	8	8
E. UTILITIES	HA	--	36	41	34	44	47
F. ENVIRONMENTAL IMPACT	JA	--	60	45	30	51	53
G. SUITABILITY FOR STRUCTURE	RTA	--	14	18	12	18	12
H. RELATED COST	Team	--	40	49	29	53	46
TOTAL			263	260	198	282	277

APPENDIX A - Site Selection

A. GEOTECHNICAL AND SEISMIC HAZARDS

General: Geotechnical and seismic hazards have been assessed for the five general site locations selected for this study. Ten different hazard considerations have been employed:

1. Geologic Stability: Based on general geologic setting and types of foundation soils or rocks as well as topography.

2. Estimated Earth Shaking Intensity: Due to earthquake, based on foundation characteristics and published maps of 1906 earthquake damage and projected relative severity of future earthquake effects at the particular sites.

3. Land Slide Hazard: Based on topography and geologic materials present at the sites, as well as published risk maps.

4. Liquefaction: Based on known liquefaction recurrences and site soil characteristics.

5. Subsidence: Due to earth shaking - none of the sites are particularly sensitive to subsidence. Good formulating materials are generally available at the depth of the structure bottom slabs.

6. Tsunami Inundation: None of the sites are subject to tsunami inundation.

7. Inundation: Or other disruption due to Reservoir Failure, such as disruption of access.

8. Fire Spread: The likelihood that fires in adjacent areas could limit access to or use of the facility.

9. Adjacent Building Debris: The likelihood of building rubble blocking streets or otherwise obstructing the use of the facility, based on the general character, density and age of surrounding buildings.

10. Related Cost: Rough assessment of relative cost associated with overcoming site hazards.

Based on hazards evaluation, none of the sites can be excluded from consideration, though some sites are clearly preferable to others. Certain hazards can be mitigated only with great difficulty or at substantial cost, and must probably be accepted to a certain degree, should the affected sites be selected. Some of these will be discussed in the following.

Christmas Tree Point: Located on Franciscan bedrock and transversed by several shear zones or faults (presumed inactive), and with steep natural slopes or man-made cuts, this site is only moderately stable, geologically speaking, and landslides in road cuts could impair access. Three water reservoirs (two covered and one open) could possibly fail, resulting in small water flows. Such flows would not necessarily pose an inundation damage problem to the facility, but could trigger slides and other access disruption and rupture of pipelines. These hazards can be mitigated only at great cost, if at all. Construction in this vicinity would be quite expensive.

Mission Dolores Park: This site is favorable with respect to the hazards considered. Blockage of access due to adjacent fires or fallen debris is a moderate hazard, but not considered very serious as there are numerous alternate access streets.

Buena Vista Park: This hilltop park site, though on relatively stable geologic materials, could suffer significant landslides, relatively costly to secure against. Exposure of access blockage due to fire or fallen debris is judged somewhat less than for Mission Dolores Park.

Jefferson Square and M.S. Hayward Playground: These two adjacent sites are relatively favorable with respect to the hazards considered. The estimated earthshaking intensity is here a little greater than at sites considered above, requiring provisions. Exposure to fire hazards and fallen building debris is nearly the same as for the Mission Dolores Park. The more level ground of the playground may offer advantages over the steeper Jefferson Square park area.

Civic Center Area: Only a few available locations present themselves in this area. The area adjacent to the site, on the Market Street side, is prone to subsidence or liquefaction. The Civic Center Area, has, therefore, been downgraded slightly in terms of geologic stability and liquefaction, though the site itself may not suffer such hazards. The area is subject to access and lifeline disruption hazards due to these geologic hazards as well as fire and building debris.

SITE SELECTION

Category A HAZARDS	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
HAZARDS							
Geologic Stability	PB	3	2 / 6	5 / 15	2 / 6	4 / 12	3 / 9
Estimated Intensity	PB	2	5 / 10	4 / 8	5 / 10	3 / 6	3 / 6
Land Slide	PB	2	2 / 4	4 / 8	3 / 6	5 / 10	5 / 10
Liquification	PB	1	5 / 5	5 / 5	5 / 5	5 / 5	4 / 4
Subsidence	PB	1	5 / 5	5 / 5	5 / 5	5 / 5	5 / 5
tsunami inundation	PB	1	5 / 5	5 / 5	5 / 5	5 / 5	5 / 5
Reservoir	PB	2	3 / 6	5 / 10	5 / 10	5 / 10	5 / 10
Fire Spread	PB	2	5 / 10	3 / 6	4 / 8	3 / 6	3 / 6
Adjacent Bldg. Debris	PB	2	5 / 10	3 / 6	3 / 6	3 / 6	3 / 6
TOTAL			61	68	61	65	61

SCORE — WEIGHTED SCORE

B. ACCESSIBILITY

General: The accessibility review judges several prime factors. Ease of approach by automobile, number of alternate roadways to reach an EOC site, and parking ability on site or adjacent to site.

Pedestrian access considers relative location of EOC site to those people who would use it on a day-to-day basis and those who would need to reach the EOC in an Emergency situation. Some consideration is given to public transportation as it would relate to day-to-day users.

The helicopter or air access review considers whether sufficient open space (ground or roof) exists near an EOC site for take-off and landings.

Christmas Tree Point: Located at the top of Twin Peaks, this site has only two roads for access. It is out of the center city area and not convenient by automobile. At a height of 800+ feet elevation, it is extremely difficult for pedestrian access and there is presently no public transportation on a regular basis. Helicopter use would be difficult because of limited flat areas, complicated by the three large antennas and the often severe winds which would hamper take-off and landing.

Parking on a day-to-day basis (30 to 40 automobiles) could be accomplished, but additional cost would be involved. In an emergency situation, the access roads would have to be controlled (one way traffic only) with one lane of the loop road at the top being used for parking).

Mission Park: This park is located in a relatively flat area of town, reasonably close to the downtown area and accessible by automobile from many directions. It has public transportation, and would be reasonably convenient for pedestrians, although somewhat distant from the Civic Center area.

Helicopter use is possible, but there are power lines in the area which will hamper easy landing and take-off.

Daily parking (30+ cars) could be accommodated in the general area. In an emergency situation, parking for 300± automobiles would be accomplished by parking in the flat areas of the park itself.

Buena Vista Park: This park is somewhat removed from the Civic Center area. Pedestrian access is possible but not at convenient as other sites. Public transportation runs near the site. Automobile access is adequate with some limitations. Helicopters would have great difficulty in landing in the area due to the hilly and highly vegetated nature of the park and the limited roadways around the park.

Day use parking could be handled in the area with some difficulty. Emergency parking for 300± cars would be nearly impossible without construction of a parking garage or other costly and special accommodation.

Jefferson Square & Hayward Playground: This area is a short walk from the Civic Center area. Public transportation is convenient and there is good multiple access by automobile. Sufficient open areas exist for helicopter take-off and landing. Parking on a day-to-day basis could be absorbed in the local conditions present. In an emergency condition, parking for 300± automobiles could be accomplished easily in the flat areas of the Hayward Playground.

Civic Center Area: This location (under Fulton Street) is convenient for pedestrian and automobile. There is multiple public transportation serving this point and helicopters can land in various parts of the open plaza or on the wider streets.

Parking in this area is difficult at all times. Provision for 30 or more cars on a day-to-day basis could probably be arranged. In an emergency situation, the roadways in and around the Civic Center area (which are not in residential neighborhoods) could be closed (partially) to allow for emergency parking.

The Christmas Tree Point site would have little cost in providing for parking but provisions would be necessary for public transportation and helicopter service.

SITE SELECTION

Category B ACCESSIBILITY	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
ACCESSIBILITY							
Automobile (Access & Parking)	RTA	3	1 / 3	3 / 9	2 / 6	5 / 15	5 / 15
Pedestrian (Public Transportation)	RTA	2	1 / 2	3 / 6	2 / 4	4 / 8	5 / 10
Air-Helicopter	RTA	1	2 / 2	4 / 4	2 / 2	5 / 5	5 / 5
TOTAL			7	19	12	28	30

SCORE / WEIGHTED SCORE

C. SECURITY

General: The security review judges the ability of the EOC site to maintain secure conditions both in a non-emergency basis and in times of emergency.

This review includes control and restriction of non-essential population and unwanted vehicular traffic. It also judges the ability of the EOC site to withstand and/or protect against riot type conditions.

Christmas Tree Point: This site, located at the top of Twin Peaks with only two roadways for access, is ideally located to be secure both in a non-emergency and in a full emergency condition.

Mission Park: Located in a rather dense neighborhood area, this EOC site would have to have special precautions taken in the facility design and the day-to-day operation to insure reasonable security.

Buena Vista Park: This site has essentially the same problems that exist at Mission Park except its hilly terrain may afford a more protected EOC location.

Jefferson Square & Hayward Playground: This site is located in a residential/business area of the City. The density is less than Mission Park, but special precautions would be necessary in facility design and operation to insure proper security.

Civic Center Area: The site located under Fulton Street would require special provisions for security. Being part of the Civic Center area, it would presumably benefit from the security features already existing in the area.

Cost: Minimum cost would be involved in making the Christmas Tree Point site secure. All the other sites would require special provisions in the design of a facility and its operation to insure reasonable security.

SITE SELECTION

Category C SECURITY	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
SECURITY							
Non-Emergency	RTA	2	5 / 10	3 / 6	3 / 6	3 / 6	3 / 6
Emergency	RTA	3	5 / 15	2 / 6	2 / 6	3 / 9	3 / 9
TOTAL			25	12	12	15	15

SCORE / WEIGHTED SCORE

D. CONTROL

General: A review of controlled conditions judges each site on the merits of controlling both vehicular and pedestrian traffic.

Christmas Tree Point: With only two access roads, this site offers excellent control of vehicular traffic. At an elevation of 800± feet, atop Twin Peaks hill, this site is also well located to control and monitor pedestrian traffic.

Mission Park: This site is located on a "block" pattern roadway system. Control of both vehicles and pedestrian would be difficult. (The location of Mission High School nearby may present some special problems for review).

Buena Vista Park: Many roads intersect with the perimeter road of the park. Also, it is located in a highly residential neighborhood. Control of pedestrian and vehicular traffic would be difficult, unless the facility is located at the top of the hill, which is not considered a practical solution for other reasons.

Jefferson Square and Hayward Playground: Basically the same conditions that exist for Mission Park except the density of the residential neighborhood is not as high.

Civic Center Area: As part of the downtown Civic Center Area, there is a continuing flow of traffic, both pedestrian and vehicular. Control would be difficult.

Cost: With the exception of Christmas Tree Point, all sites present problems in the control of pedestrian and vehicular traffic. Proper facility design and placement should correct these problems but there would be cost involved. It should be noted that the same requirements to control traffic would be part of the requirements for EOC security.

SITE SELECTION

Category D CONTROL	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
CONTROL							
Traffic	RTA	2	5 / 10	2 / 4	2 / 4	2 / 4	2 / 4
Pedestrian	RTA	2	5 / 10	2 / 4	2 / 4	2 / 4	2 / 4
TOTAL			20	8	8	8	8

SCORE — WEIGHTED SCORE

E. UTILITIES

General: This reviews each site in terms of availability and accessibility of gas, electricity, water, telephone and sewer utility lines.

Christmas Tree Point: Sewer lines are available at the site and utility poles bring overhead electrical power and telephone lines to the site. Water service is probably not adequate and would have to be increased by the utility company. Gas is not available at this site.

Mission Park: Underground sewer, gas and water lines are all available at this site. Overhead electrical power and telephone lines run along the four streets which frame this park and are readily accessible.

Buena Vista Park: Underground sewer, gas and water lines are under the streets which encircle this park. Electrical power and telephone lines run underground along the curved streets to the east, west and south. Electrical power and telephone lines run overhead along Haight Street on the north. Because of the size and hilly terrain of this Park, extension of utilities to a building on this site would be more difficult than for a smaller, level site.

Jefferson Square & Hayward Playground: Underground sewer, gas and water lines are readily accessible from this site. Overhead electrical power and telephone lines run along Turk Street which divides these two sites and these services may be readily extended to either Jefferson Square to the north or Hayward Playground to the south.

Civic Center Area: Sewer, gas, water, electrical power and telephone lines are all underground and available to this site.

Cost: Mission Park and Jefferson Square and Hayward Playground sites should have the lowest utility costs. The general congestion of the Civic Center Area could result in

slightly higher utility costs. The large, uneven terrain at the Buena Vista site should increase its utility cost over the other sites, except for Christmas Tree Point where the present unavailability of gas and inadequate water service will cause this site to have the highest utility costs.

SITE SELECTION

Category E

UTILITIES

	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
UTILITIES							
Gas	HA	2	1 / 2	3 / 6	3 / 6	3 / 6	3 / 6
Electricity	HA	2	2 / 4	4 / 8	2 / 4	4 / 8	4 / 8
Water	HA	3	3 / 9	3 / 9	3 / 9	3 / 9	3 / 9
Telephone	HA	3	2 / 6	4 / 12	2 / 6	4 / 12	4 / 12
Sewer	HA	3	5 / 15	2 / 6	3 / 9	3 / 9	4 / 12
TOTAL			36	41	34	44	47

SCORE / WEIGHTED SCORE

SITE SELECTION

Category F ENVIRONMENTAL IMPACT	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
ENVIRONMENTAL IMPACT	JA						
Construction Dust Noise Disruption	JA	2	2 / 4	3 / 6	2 / 4	3 / 6	1 / 2
Traffic	JA	3	4 / 12	3 / 9	2 / 6	3 / 9	4 / 12
Air Quality	JA	3	3 / 9	3 / 9	2 / 6	3 / 9	3 / 9
Flora and Fauna	JA	2	4 / 8	3 / 6	1 / 2	3 / 6	4 / 8
Historical	JA	1	3 / 3	2 / 2	3 / 3	4 / 4	4 / 4
Political or Community Concern	JA	2	3 / 6	1 / 2	1 / 2	2 / 4	3 / 6
Acoustic, Noise, Vibration	JA	3	2 / 6	2 / 6	1 / 3	2 / 6	2 / 6
Aesthetics	JA	1	4 / 4	3 / 3	2 / 2	3 / 3	3 / 3
Land Use Compatibility	JA	2	4 / 8	1 / 2	1 / 2	2 / 4	4 / 8
TOTAL			60	45	30	51	58

SCORE / WEIGHTED SCORE

F. ENVIRONMENTAL STATEMENT

Each proposed site has been evaluated according to the environmental impact of the proposed action.* This section of the report presents a brief discussion of the environmental assessment of the five (5) sites under study. This is followed in Chapter 10 by a more detailed environmental evaluation of the selected site.

Methodology

The methodology used in this evaluation follows a three step process: rating, ranking and weighting. First, each study site was assessed by using an "Environmental Checklist Form" which is included in the Appendix. Each factor was rated according to its magnitude of impact based on the following scale:

1. Adverse Significant
2. Adverse Slight
3. None
4. Beneficial Slight
5. Beneficial Significant

The second step in the evaluation process involved a comparison of the sites based on a ranking using a 5-point scale with variation depending on the magnitude of the potential effect. Five represents the most acceptable and 1 the least acceptable.

The environmental factors exhibiting significant impact were then selected and weighted on a scale from 1 to 3, with 1 being the least important and 3 the most important factor. The weighted value for each factor was applied to the score of that factor for each site to obtain the final weighted score. The site with the highest total weighted score was

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* The following factors were not considered in this assessment: hazards, accessibility, security, control, utilities, suitability for structure or related cost. They were included as part of other sections of the overall site analysis process.

considered the most acceptable site from an environmental perspective. Based on the above methodology the Christmas Tree Point was found to be most acceptable, followed closely by the Civic Center Area site. The Jefferson Square/ M.S. Hayward Playground, Mission Park, and Buena Vista Park sites were all somewhat lower in acceptability. The weighted score sheet is included in the Appendix.

Summary of Environmental Assessment

Christmas Tree Point

The proposed facility, would be located adjacent to the city's Department of Electricity Communication Towers. The communication towers are located on one of the two peaks in the area, and the proposed EOC facility would be located on the other peak. The site is presently undeveloped. Apart from the communication towers the closest development, mostly middle income residential, is approximately 2,000 feet downhill from the site. The slopes at the site are greater than 30%, and the vegetation mostly shrubs. The site is directly exposed to strong winds which blow away any air emissions. The ambient noise level is generally low. The proposed project would result in the following environmental impacts:

- Because of the surrounding steep slopes the construction in excavation and disposing of soil. The facility's construction would alter the ground surface relief features.

- People living on the slopes and valley would be exposed to increased noise both from construction equipment and from the standby generators. However, the generators would be operated only about once a week, for a short period of time.

- Traffic circulation in the area during construction would be temporarily disrupted on one of the two access/egress routes to a hilltop vista point.

- Although this facility is an Emergency Operations Center, it would require some public services such as fire and police protection.

- The topography of the site is such that the site is exposed to high wind speeds which would carry dust produced during construction to properties located on the slopes and in the valley.

Civic Center Area

This proposed site is located in a highly urbanized area in the midst of many public office buildings. It is immediately adjacent to the San Francisco Public Library. During working hours the ambient noise level in the area is approximately 60 dB(A). The site is presently being used for parking, some of it associated with Brooks Hall, a public exhibition and meeting hall. The proposed project would result in the following impacts:

- The construction of the EOC will temporarily displace parking presently on the site. Earth moving equipment and haul trucks would restrict traffic flow in the area. The presence of the construction equipment would affect the visual environment of the Civic Center area.

- Existing day-time ambient noise levels in the vicinity of the site are high (in excess of 60 dB(A). The EOC weekly operational checks of the generators would add to the noise level and in particular affect the adjacent library.

- The micro-wave attenna would introduce a visual intrusion unless carefully blended into the surrounding landscape.

Mission Park

The proposed site would be located on public open space in a predominantly middle income residential neighborhood. The space is presently being used as a recreation park. The land uses immediately to the north and east of the site are mainly institutional (a school on the north and churches on the east), and residential immediately to the west and south. The noise and air quality of the general area is characteristic of a residential environment and generally of high quality.

Preliminary assessment of the possible environmental effect of locating the proposed project at Mission Park revealed the following impacts:

- There would be a temporary disruption in the use of approximately half of the park due to the construction of the facility.
- Large quantities of earth would have to be excavated and disposed of at another location(s).
- The site is partially bounded by sensitive land uses such as homes and a school. People in the area would be exposed to construction noise and the generator testing noise.
- According to the City Master Plan the site is zoned for public open space and is presently being used as a recreation park. Consequently, the proposed facility would require special city clearance.
- There is no off-street public parking in the immediate vicinity. Most of the parking is on-street. The proposed project would result in a new parking demand with the possibility of creating a shortage. In addition, traffic circulation would be disrupted during construction.

Jefferson/M.S. Hayward Playground

The proposed site is located on public open space, one block away from the Civic Center Area. It is divided by Turk Street into a northern half (Jefferson Square) and a southern half (M.S. Hayward Playground). The surrounding properties on the west and south edges are generally low income residential; on the eastern edge the land use is mixed (insittutional, commercial and residential). The Fire Department emergency operation facility, with its attendant antennas, is located on M.S. Hayward Playground portion of the site. The ambient noise level is slightly below 60 dB(A), and the air quality is good. Jefferson Square is grass covered and contains some dispersed mature trees. However, M.S. Hayward Playground has predominately grass covering.

Environmental impacts at this site are similar to those at Mission Park, but differ in the magnitude of potential impacts. At both sites the proposed action affects the same environmental factors; however, because of the difference in the ambient noise level and the slight difference in the surrounding land use, the magnitude of the effects of the environmental factors at Jefferson/ M.S. Hayward Playground would be less significant that at Mission Park. Based on the similarity of impacts, the environmental impact discussion presented for Mission Park would apply to Jefferson/M.S. Hayward Playground site.

Buena Vista Park

This site is surrounded by middle income residential units and a hospital. Generally the area is quiet; the only source of noise is from vehicular traffic. The site has steep slopes (more than 10%), and is covered with mature trees which create a natural habitat for certain species of birds and animals.

The proposed project would result in the following impacts:

- Topography or ground surface relief features would be altered.

- The existence of a number of mature species of plants (trees and shrubs) including animals would be threatened.

- People in the surrounding area would be exposed to construction and generator noise. The perception of the noise impacts at this site would exceed any of the sites considered because of the relative low ambient noise level.

- The area is zoned (P) for public open space and would require special approval for any other uses.

- Parking spaces in the vicinity of the project site are scarce. There are no undeveloped parcels to be acquired thus the new parking demand would add to the present on-street parking demand.

ENVIRONMENTAL CHECKLIST FORM

SITE: JEFFERSON SQUARE/M.S. HAYWARD PLAYGROUND

ENVIRONMENTAL IMPACTS
(Explanations of all "yes" and "maybe" answers are required on attached sheets.)

	YES	MAYBE	NO	MAGNITUDE OF POTENTIAL EFFECT
1. Earth. Will the proposal result in:				
a. Unstable earth conditions or in changes in geologic substructures?			X	
b. Disruptions, displacements, compaction or overcovering of the soil?	X			1 2 3 4 5 / 0
c. Change in topography or ground surface relief features?			X	
d. The destruction, covering or modification of any unique geologic or physical features?			X	
e. Any increase in wind or water erosion of soils, either on or off the site?			X	
f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?			X	
g. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards?			X	
2. Air. Will the proposal result in:				
a. Substantial air emissions or deterioration of ambient air quality?			X	
b. The creation of objectionable odors?			X	1 2 3 4 5 / 0
c. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?			X	
3. Water. Will the proposal result in:				
a. Changes in currents, or the course or direction of water movements, in either marine or fresh waters?			X	
b. Changes in absorption rates, drainage patterns or the rate and amount of surface water runoff?			X	1 2 3 4 5 / 0
c. Alterations to the course or flow of flood waters?			X	
d. Change in the amount of surface water in any water body?			X	
e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?			X	
f. Alteration of the direction or rate of flow of ground waters?			X	
g. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?			X	
h. Substantial reduction in the amount of water otherwise available for public water supplies?			X	
i. Exposure of people or property to water related hazards such as flooding or tidal waves?			X	
4. Plant Life. Will the proposal result in:				
a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, microflora and aquatic plants)?			X	
b. Reduction of the numbers of any unique, rare or endangered species of plants?			X	1 2 3 4 5 / 0
c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?			X	
d. Reduction in acreage of any agricultural crop?			X	

	YES	MAYBE	NO	1	2	3	4	5
5 Animal Life. Will the proposal result in								
a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna)?			X			0		
b. Reduction of the numbers of any unique, rare or endangered species of animals?			X					
c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?			X					
d. Deterioration to existing fish or wildlife habitat?			X					
6 Noise. Will the proposal result in:								
a. Increases in existing noise levels?			X		0			
b. Exposure of people to severe noise levels?		X						
7. Light and Glare. Will the proposal produce new light or glare?			X					
8 Land Use. Will the proposal result in a substantial alteration of the present or planned land use of an area?		X			0			
9 Natural Resources. Will the proposal result in:								
a. Increase in the rate of use of any natural resources?			X			0		
b. Substantial depletion of any nonrenewable natural resource?			X					
10 Risk of Upset. Does the proposal involve a risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?		X			0			
11 Population. Will the proposal alter the location, distribution, density, or growth rate of the human population of an area?			X			0		
12. Housing. Will the proposal affect existing housing, or create a demand for additional housing?			X			0		
13 Transportation/Circulation. Will the proposal result in:								
a. Generation of substantial additional vehicular movement?	X				0			
b. Effects on existing parking facilities, or demand for new parking?	X							
c. Substantial impact upon existing transportation systems?			X					
d. Alterations to present patterns of circulation or movement of people and/or goods?			X					
e. Alterations to waterborne, rail or air traffic?			X					
f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians?			X					
14 Public Services. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas								
a. Fire protection?		X			0			
b. Police protection?		X						
c. Schools?			X					
d. Parks or other recreational facilities?		X						
e. Maintenance of public facilities, including roads?			X					
f. Other governmental services? (HEALTH)		X						
15 Energy. Will the proposal result in								
a. Use of substantial amounts of fuel or energy?		X			0			
b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?			X					
16 Utilities. Will the proposal result in a need for new systems, or substantial alterations to the following utilities								
a. Power or natural gas?			X			0		
b. Communications systems?			X					
c. Water?			X					
d. Sewer or septic tanks?			X					
e. Storm water drainage?			X					
f. Solid waste and disposal?			X					

	YES	MAYBE	NO
17. Human Health. Will the proposal result in:			
a Creation of any health hazard or potential health hazard (excluding mental health)?	___	___	X
b. Exposure of people to potential health hazards?	___	___	X
18. Aesthetics. Will the proposal result in the obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?	___	X	___
19. Recreation. Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities?	___	X	___
20. Archeological/Historical. Will the proposal result in an alteration of a significant archeological or historical site, structure, object or building?	___	___	X
21. Mandatory Findings of Significance.			
(a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	___	___	X
b Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	___	___	X
c Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)	___	___	X
d Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	___	___	X

1	2	3	4	5
			0	

1	2	3	4	5
	0			

1	2	3	4	5
		0		

1	2	3	4	5
		0		

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures

SITE SELECTION

Category F ENVIRONMENTAL IMPACT	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
ENVIRONMENTAL IMPACT	JA						
Construction Dust Noise Disruption	JA	2	2 / 4	3 / 6	2 / 4	3 / 6	1 / 2
Traffic	JA	3	4 / 12	3 / 9	2 / 6	3 / 9	4 / 12
Air Quality	JA	3	3 / 9	3 / 9	2 / 6	3 / 9	3 / 9
Flora and Fauna	JA	2	4 / 8	3 / 6	1 / 2	3 / 6	4 / 8
Historical	JA	1	3 / 3	2 / 2	3 / 3	4 / 4	4 / 4
Political or Community Concern	JA	2	3 / 6	1 / 2	1 / 2	2 / 4	3 / 6
Acoustic, Noise, Vibration	JA	3	2 / 6	2 / 6	1 / 3	2 / 6	2 / 6
Aesthetics	JA	1	4 / 4	3 / 3	2 / 2	3 / 3	3 / 3
Land Use Compatibility	JA	2	4 / 8	1 / 2	1 / 2	2 / 4	4 / 8
TOTAL			60	45	30	51	58

SCORE / WEIGHTED SCORE

G. SUITABILITY FOR STRUCTURE

General: This reviews each proposed site in terms of its natural features: topography, availability of usable space, existing vegetation, and other such features which either add or detract in the placement of an EOC facility and its related needs for parking.

Christmas Tree Point: It would be possible to construct a 30,000 (+) square foot facility next to the existing communications building. Because of limited building area around this facility, construction would most likely be two levels. Such construction would be more costly than one level construction. It is possible to expose some mechanical equipment items which would be cost effective. The area for parking would be reduced and at a premium. Special precautions would be necessary if this site is to remain open to the public as a viewing area.

Mission Park: This site has some gentle changes in grade which would allow the placement of a facility into an up slope section of land. Such a facility would allow for access at grade or by a gradual downward ramp. The facility would be covered by earth except at the entrance and the site could be returned to its natural topography and function after the construction was completed. No major trees would be lost to construction.

Buena Vista Park: This hilly and densely tree covered site presents major problems in the placement of an EOC facility. There appears no suitable area for a contractor's plant and the perimeter roads are narrow and congested with residential traffic and parking. Any site selected for construction would result in the loss of major existing vegetation. Special provisions would be required for parking 600 vehicles.

Jefferson Square & Hayward Playground: The conditions of this site are nearly equal to those of Mission Park. A facility could be located in the up slope portions of Jefferson Square. Entrance could be at grade or by a gentle down grade ramp. The facility would be underground and the final condition would return the area to its original use and topography. The only evidence of the facility would be its entrance and a few minor air shafts which could be screened by planting. No major trees would be lost in construction and only about 1/3 to 1/4 of the park area would be required during construction.

Civic Center Area: A facility constructed under Fulton Street (between Larkin and Hyde) would be totally underground Parking Garage). This portion of Fulton is used for parking and some traffic. Closing of the street for several years would not greatly affect the general traffic in the area. Construction would be similar to that used for the B.A.R.T. stations on Market Street.

Cost: Construction cost would be highest at the Civic Center Area and Buena Vista Park because of the tight construction conditions. Christmas Tree Point could also prove expensive because of its remote location and the necessary rock work. Also for necessary utility runs. The least expensive construction conditions would probably occur at Mission Park and Jefferson Square. Both would require a minimum of deep water construction and general excavation.

SITE SELECTION

Category G SUITABILITY FOR STRUCTURE	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
SUITABILITY							
Topography	RTA	2	4 / 8	4 / 8	3 / 6	4 / 8	3 / 6
Space Availability	RTA	2	3 / 6	5 / 10	3 / 6	5 / 10	3 / 6
TOTAL			14	18	12	18	12

SCORE / WEIGHTED SCORE

SITE SELECTION

H. RELATED COST

RELATED COST	TEAM REVIEWER	WEIGHTED VALUE	CHRISTMAS TREE POINT	MISSION PARK	BUENA VISTA PARK	JEFFERSON SQUARE M.S. HAYWARD PLAYGROUND	CIVIC CENTER AREA
HAZARDS	PB	3	1 / 3	4 / 12	2 / 6	4 / 12	3 / 9
ACCESSIBILITY	RTA	2	3 / 6	4 / 8	1 / 2	5 / 10	5 / 10
SECURITY	RTA	2	5 / 10	3 / 6	2 / 4	3 / 6	3 / 6
CONTROL	RTA	1	5 / 5	2 / 2	2 / 2	2 / 2	2 / 2
UTILITIES	HA	3	2 / 6	3 / 9	3 / 9	3 / 9	3 / 9
ENVIRONMENTAL IMPACT	JA	2	4 / 8	2 / 4	2 / 4	2 / 4	3 / 6
SUITABILITY FOR STRUCTURE	RTA	2	1 / 2	4 / 8	1 / 2	5 / 10	2 / 4
TOTAL			40	49	29	53	46

SCORE — WEIGHTED SCORE

APPENDIX B - Detailed Space Programs

A. SPACE REQUIREMENTS - 911 EMERGENCY CENTER

1. Operations Space Requirements

Communications Center		3,000 sf
Administrative		2,500
Reception and Control		250
	Sub Total	5,750
Circulation @ 15%		860
	Total	6,610 sf

2. Support Spaces - Human

Toilets		400 sf
Lunch Space		400
Repair		200
Custodial		100
Reproduction		150
Security		100
	Sub Total	1,350
Circulation @ 15%		200
	Total	1,550 sf

3. Support Spaces - Mechanical & Electrical

Generator	400 sf
Computer	1,250
Battery Room	150

Telephone Equipment	300	sf
Data Transmissions Equipment	750	
Transformer	100	
Mechanical Equipment Room	2,000	
Sub Total	4,950	
Circulation @ 15%	745	
Total	5,695	sf

4. Summary

Operations Space	6,610	sf
Support Space - Human	1,550	
Support Space - Mechanical & Electrical	5,965	
	14,125	sf

B. SPACE REQUIREMENTS - EMERGENCY OPERATIONS CENTER

1. Operations Space Requirement

Operation Room EOC		1,600 sf
Communications Room EOC		2,000
Operations Control		2,070
Primary Response Service		4,110
Support Service		2,220
Reception & Control		250
	Sub Total	12,250
Circulation @ 15%		1,835
	Total	14,085

2. Support Spaces - Human

Sanitary		550 sf
Food Service		2,350
Sleeping		1,800
Medical		350
Maintenance		670
Miscellaneous		650
	Sub Total	6,370
Circulation @ 15%		955
	Total	7,325

3. Support Spaces - Mechanical/Electrical

Generators		400 sf
Battery Room		450
Computers		400
Telephone Equipment		300
Data Transmission Equipment		600
Mechanical Equipment Room		2,500
Transformer		150
Water Supply (50,000 gal - 16' dia x 45')		*
Fuel Oil (8,000 gal - 10' dia x 15')		*
	Sub Total	4,400
Circulation @ 15%		660
	Total	5,060

4. Summary

Operations Space		14,085 sf
Support Space - Human		7,325
Support Space - M & E		5,060
	Total	26,470

* Tanks buried adjacent to structure - not part of area count.

C. SPACE REQUIREMENTS - COMBINED EOC & 911 EMERGENCY CENTER

1. Operations Space Requirements

Operation Room EOC	1,600	sf
Communications Room EOC	800	
Operations Control[1]	2,070	
Primary Response Service	4,110	
Support Service	2,220	
Communications Room 911[2]	2,500	
Reception & Control	250	
Sub Total	13,550	
Circulation @ 15%	2,030	
Total	15,580	sf

2. Support Spaces - Human

Sanitary	550	sf
Food Service	2,350	
Sleeping	1,800	
Medical	350	
Maintenance	670	
Miscellaneous	650	
Sub Total	6,370	
Circulation @ 15%	955	
Total	7,325	sf

[1] Day-to-day EOC operations will utilize portions of this space.

[2] Administrative operations will utilize fire, police and health space allocated in this section.

3. Support Spaces - Mechanical/Electrical

Generators	400 sf
Computers	1,550
Public Health @ 200 Police Dept @ 600 Fire Dept @ 450 City Admin @ 300	
Telephone Equipment	300
Data Transmission Equipment	1,200
Mechanical Equipment	3,000
Transformer	150
Battery Room	450
Water Supply (50,000 gal - 16' dia x 45')	*
Fuel Oil (8,000 gal - 10' dia x 15')	*
Sub Total	7,050
Circulation @ 15%	1,060
Total	8,110 sf

4. Summary

Operations Space	15,580 sf
Support Space - Human	7,325
Support Space - M & E	8,110
Total	31,015 sf

* Tanks buried adjacent to structure - not part of area count.

D. BACK UP DATA - SPACE & MANPOWER

Operations Space

1. Operations Control	No. Per Shift		Total		Area	
Mayor	4	(@40)	(3@10)	7	190	sf
Board of Supervisors	14	(@40)	(3@10)	17	590	
CAO	2	(@40)	(1@10)	3	90	
Emergency Services	3	(@40)	(2@10)	5	140	
Legal	3	(@10)	(3@10)	6	150	
Operational Information	7	(@40)	(11@10)	18	390	
Public Information	4	(@40)	(3@10)	7	190	
Radiological Defense	2	(@40)	--	2	80	
Military Liaison	5	(@40)	(5@10)	10	250	
(Facility Maint. & Operation)	13	*		23	0	
	57			98	2010	sf
2. Primary Response Services						
Fire & Rescue	9	(@40)	(8@10)	17	440	sf
Law Enforcement & Traffic Control	15	(@40)	(12@10)	27	720	
Health & Medical	12	(@40)	(10@10)	22	580	
Welfare & Shelter	5	(@40)	(4@10)	9	240	
Utilities	21	(@40)	(21@10)	42	1050	
Engineering Const. & Housing	22	(@40)	(20@10)	42	1080	
	84			159	4110	sf

* See Section Support Space (Human Use) following.

3. Support Services	No. Per Shift	Total	Area
Communications & Warning Message Center	8 (@40)	(7@10)15	390 sf
Fiscal Control	7 (@40)	(5@10)12	330
Supply & Procurement	15 (@40)	(11@10)26	710
Transportation & Warehousing	6 (@40)	(5@10)13	340
Manpower	6 (@40)	(5@10)11	290
Religious Affairs	3 (@40)	(2@10) 5	140
	46	82	2200
Total:	187	339	8380 sf

Support Space (Human Use)

1. Sanitary	
Toilet Rooms - Male	250 sf
Toilet Rooms - Female	250
Showers - Male	50
Showers - Female	50
Decontamination	50
	550 sf

2. Food Service	
Kitchen	450 sf
Storage - Dry	200
Storage - Cold	100
Dining Room (rec.)	1,600
	2,350 sf

3. Sleeping	
Dormitory - Male	1,200 sf
Dormitory - Female	600
	1,800 sf
4. Medical	
Treatment	100 sf
Isolation	200
Storage	50
	350 sf
5. Maintenance	
Custodial	150 sf
Engineer (plant)	120
Workshop	150
Storage	200
Communications Repair	100
Laundry	100
	670 sf
6. Miscellaneous	
Reproduction	200 sf
Security	150
Entrance Structure	300
	650 sf